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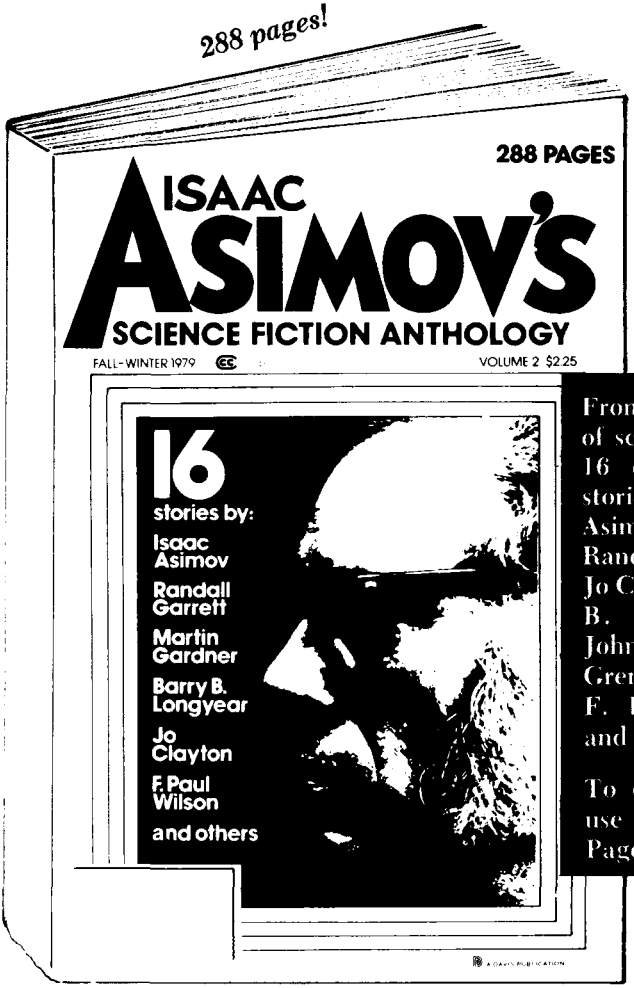

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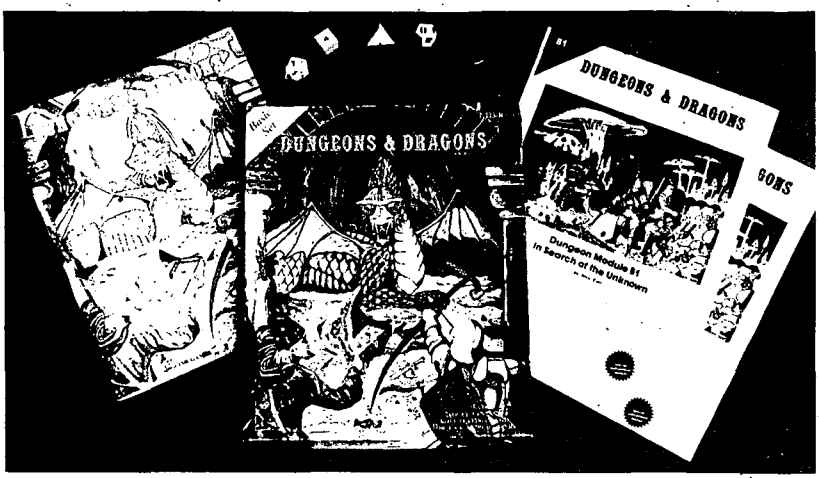

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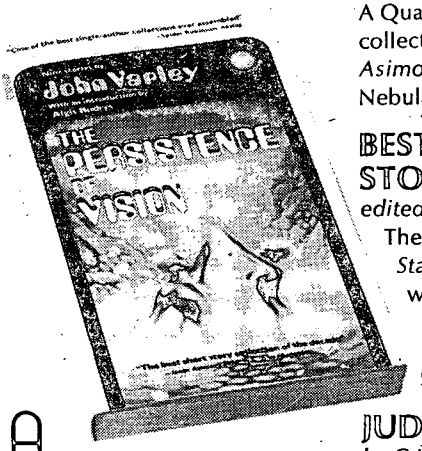

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EDITORIAL: THE VOCABULARY OF SF

by Isaac Asimov

art: Frank Kelly Freas

Like every specialized occupation, science fiction writing has a vocabulary of its own; and the more advanced writers assume the reader understands that vocabulary. Occasionally, this sets up a barrier against the new reader, who finds difficulty in understanding what's being said.

Thus, a reader once wrote to ask the difference between "android" and "robot" saying, "I have been trying to find out, but so far have gotten no satisfactory explanation."

Well, this is the right shop for explanations. The only difficulty is that I don't like explain anything briefly, so be patient.

The Greek word "anthropos" means "human being," and from that comes the adjective "anthropoid." Since the suffix "-oid" is from the Greek word for "form," "anthropoid" means "humaniform" or "resembling a human being in form."

"Anthropoid" entered the ordinary language in recent centuries, when Europeans became particularly conscious of the apes of Africa and southeast Asia. The word "ape" was originally given to the tailless Barbary ape of North Africa. The new species–chimpanzee, gorilla, orangutan, and various gibbons–are also apes, since they are tailless; but they are much more human in appearance than the Barbary apes are. The newly-discovered apes were therefore distinguished from the longer-known one by being called "anthropoid apes."

Since in English, there is a continuous drive toward shortening and simplifying the language, there is a tendency to drop a noun in any oft-used adjective-noun combination and to use the adjective alone as the noun. This is frowned upon by careful users of the language, but it is constantly being done. For instance, I have heard apes referred to as "anthropoids" in absolute contradiction of the actual meaning of the word.

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The proper word for "apelike" is "pithecoid" from "pithekos," the Greek word for "ape."

The Greek word "andros," means "man," as used for a male human being rather than for the species generally. The word "android" means "male-like," but it is usually defined as "man-like" with the careless unconcern that marks the male chauvinism of the English language.

Now, then, if a scientist were to produce an artificial device that had the shape and appearance of a human being and imitated the functioning of a living being, the proper name for it would be "an anthropoid device," or, using the adjective only, "an anthropoid."

This term is not used, probably because of the apelike flavor of the word. Instead, the artificial human being is "an android device" or "an android."

Strictly speaking, an android should be an artificial device with the appearance of a male human being. One with the appearance of a female human being would be a "gynoid," from the Greek word "gynos" meaning "woman." However, I have never seen the word "gynoid" used for any artificial device of human appearance. "Android" is used for artificial devices that mimic either sex–or, for that matter, that are neuter.

But if an android is an artificial human being, where does "robot" come in?

In 1920, the Czech playwright, Karel Capek, published a play* named *R.U.R.* which was first performed in 1921 and first translated into English in 1923. The initials "R.U.R." stand for "Rossum's Universal Robots." Rossum is the name of the Englishman who, in the play, mass-produced a line of mechanical human beings intended to do the work of the world.

Why "robot"? Because it is from a Czech word "robota" meaning one who is engaged in involuntary servitude; in other words a "slave." In translating the play into English, it would have been appropriate to translate "robot" into "slave." "Slave," however, is a word commonly used for human beings; and it would make it difficult to distinguish between the natural and the artificial variety. "Robot," not being an English word, could fairly be left untranslated and be used for the artificial variety, to distinguish it from the natural.

Capek's play is, in my own opinion, a terribly bad one; but it is

*Odd that the word "robot" should have been invented in the year of my birth. Pure coincidence!

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immortal for that one word. It contributed the word "robot" not only to English but, through English, to all the languages in which science fiction is now written.

Strictly speaking, "robot" and "android" both refer to artificial human beings and might be synonymous. However, in the many robot stories that appeared in the science fiction magazines from 1926 onward, the robots were almost always described and pictured as being constructed of metal. Consequently, "robot" has come to refer specifically to an artificial human being built largely or entirely of metal.

Any artificial human being built of substances more closely resembling human tissues retains the older name "android." –And that is the distinction between the two words.

There is an irony here. Capek, in the play, *R.U.R.*, in which the word "robot" was invented, described artificial human beings that were *not* robots in the present-day sense. They were androids.

We're not through. Consider the Greek word "automatos," which means "self-acting." Any device that is self-acting, and does not require constant human direction, is said to be an "automatic device."

We might imagine an artificial human being would be called an automatic device and then, through noun-dropping, an "automatic." However, the word "automatic," has already been obtained through noun-dropping from "automatic pistol" and refers to a self-loading hand-gun.

Instead, the related word "automaton" is used for an artificial human being. However, "self-acting" seems to imply moving according to a fixed plan without much, if any, leeway for modification. Consequently, "automaton" could be used for an android or robot (or, if it comes to that, for a human being) without much, if any, intelligence. Science fiction robots are usually pretty intelligent so "automaton" is not much used.

How about Latin? The word "homo" in Latin means "man" and from "homo" is derived the adjective, "humanus." This gives us our own adjective "human." We can speak, therefore, of "human beings," or, dropping the noun, "humans." Well, then, would not an artificial object of human shape be a "humanoid?"

Yes, indeed; but "android" fills that niche. Instead, in science fiction writing, "humanoid" is usually used for a *living* creature of human shape, one that has been born or has evolved and *not* one that has been made–but one that has been born or has evolved on some planet other than Earth.

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The Latin word for "Earth" is "Terra." Any living species that has evolved on Earth is a "terrestrial being"; any living species that has evolved on some planet other than Earth is an "extraterrestrial being" (where "extra" is a Latin word meaning "on the outside.") In the case of "extraterrestrial beings" it is quite common, in science fiction, to drop the noun and speak of "extraterrestrials."

Strictly speaking, any species that has evolved on some planet other than Earth is an extraterrestrial; but in science fiction, the term is usually restricted to intelligent species. If the species should happen to be human in appearance, it is also humanoid.

The Latin word "monstrum" means "an omen that warns against misfortunes" from "monere" meaning "to warn." Animals or human beings who are born misshapen were considered divine warning of misfortune to come, and in English they are called "monsters."

Mary Shelley applied the term to the large, misshapen being that Frankenstein formed out of bits and pieces of dead body-parts; and it was "Frankenstein's monster." Because of the influence of that book the word "monster" is used for any living object that is unu-

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sually large and terrifying. Hence, the sub-category of "monster movies."

The word "golem" in Hebrew represents a shapeless mass not yet given life; in that sense it is close to "monster" in the Frankenstein sense. The related Arabic word "ghulam" means "servant," and in that sense the word is close to "robot." A "golem," I think, would be a robot that is given life through religious spells rather than through scientific principles.

There you are, Gentle Reader: write to me if any part of the science fiction vocabulary puzzles you; and now and then I will devote an editorial, or part of one, to such matters.

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I feel that one of the functions of this column, aside from running down and/or digging up good reading matter for you addicts, is at times to alert you to events and trends in science fiction publishing. Herewith one such, the sudden advent of the "trade" or oversized paperback into the fiction area. (I say fiction as opposed to SF/fantasy art books, which have been around for a while.)

More and more fiction is being initially published in this format, which is not only large-sized, but large-priced–anywhere from $4.95 to $8.95. It seems to be filling the gap between the regular paperbacks and the hard covers, which are now so astronomical in price that a novel must almost be a for-sure best seller to justify its being published that way. But even the trade paperback price is a stiff tariff to ask. Presumably the publishers find it economically rewarding; authors may, depending on what kind of deal they've made with the publisher; it's the readers who lose. A paperback is still a paperback, no matter how big it is; and the only asset for the reader, and it's a debatable one, is that some of these books are illustrated. That's nice in theory, but it obviously depends on the quality of the illustrations as to whether they're worth part of that extra outlay.

But for those of you on a limited book budget, be aware that it is almost certain that all the trade editions will eventually appear in mass-market (regular paperback) format.

A perfect example is Jerry Pournelle's *Janissaries*. It's a dandy

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piece of classic science fiction; and the illustrations by Bermejo, in this case, are quite good indeed; and there are certainly a lot of them ("massively illustrated," it says on the cover).

Janissaries concerns a CIA-backed outfit of mercenaries, about to be wiped out in Africa, who are rescued by a flying saucer (have you noticed that UFOs in the traditional sense are now respectable in SF?). The mixed alien and humanoid crew demand as a price of rescue that the mercenaries supervise the growing and harvesting of a certain plant on a far-distant planet; with very little choice, they agree.

The planet Tran turns out to be inhabited by humans, descendants of successive waves brought in at 600-year intervals to harvest the mysterious crop, which grows in cycle with the erratic orbit of the third sun of a triple sun system. So we have kingdoms of wild Celtic mountain men, a mini-Roman Empire complete with togas, and so on. There is dissidence within the mercenary group and lots of problems outside it, a beautiful princess, battles, and intrigue, as the third sun grows nearer, bringing with it the promise of planet-wide natural disasters and the return of the star-travelling aliens.

As I said, it's good, classic, militaristically knowledgeable SF. And, by the way, militaristic is not a negative word in my book; and I'm tired of it being thrown as an epithet (mostly by outsiders) at the field. SF has traditional roots in the action/adventure writing school, and it's a little hard to have action and adventure on any scale without employing Empires and Armies.

Back to the original point, though. Whether you will want to pay $6.95 for *Janissaries,* good as it may be, is up to you.

Elizabeth A. Lynn's proposed trilogy that began with *Watchtower* is also militarist, in an anti-militarist sort of way. Part two is at hand, titled *The Dancers of Arun.*

Watchtower bothered me, because despite the obvious writing talents of the author, it didn't seem to be much of one thing or another. Obviously taking place on Earth, given the food, flora, and fauna, but in a locale and period unplaceable, it had nothing but a hint of any fantasy elements and, aside from the milieu, could almost have been a historical novel.

The Dancers of Arun is a little more like it. It takes place several generations after *Watchtower* and concerns the flowering of the pacifist warrior cult, the chearis, whose beginning we saw in the first book. It also has to do with the witchgifts, psychic powers up to now more or less verboten in the culture.

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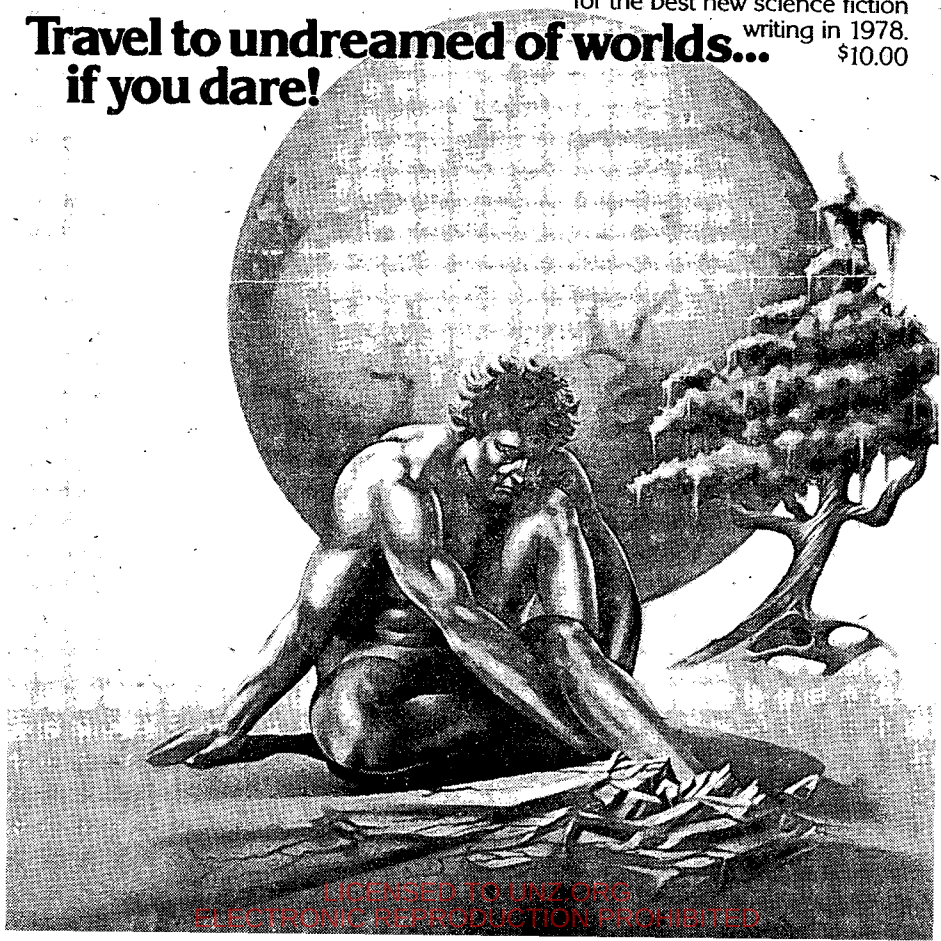

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The protagonist is the crippled younger brother of a leading cheari; the brothers have long been separated; and Kel, the older, takes Kerris to share the life of the chearis, with the painful knowledge that he can never become one because of his physical disability. But there is also the matter of developing Kerris's witchgift, and Ms. Lynn coolly introduces incest as another factor.

I like her societal concepts (the chearis' use of dance is particularly striking); I like her people, who are complex and interesting; in all, I like her writing. But perhaps *The Dancers of Arun* is yet a bit overbalanced with character rather than concept, and concept is still the excitement of fantasy and SF.

On the other hand, there is such a thing as going too far in the other direction. Piers Anthony, in his trilogy beginning with *A Spell for Chameleon,* apparently decided to invest his magical land of Xanth with every fantastical concept ever invented. It has quests, enchanted castles, riddles, unicorns, griffins, mermaids, giants (not to mention invisible giants), zombies, ghosts, elves, magicians, man-eating trees, enchantresses, and a host of inventions from Anthony's own fertile mind. Every person, animal, creature, plant, and even rock in Xanth is magic or has a magical talent; the resulting stories are giddy, fast-paced as a Concorde, and a bit too cute for my taste. It's like Oz raised to the Nth power of bedlam.

For instance, in the third book about Xanth, *Castle Roogna,* we almost immediately run into umbrella and parasol trees, a pillow bush, bug-bomb weeds, and a vegetarian ogre named Crunch who speaks in abominable rhyming couplets. We're in the second generation here, since our hero is young Dor, son of the main characters of *Chameleon.* His talent is talking to inanimate objects; and he and Grundy, the ex-golum, set out at the behest of the King of Xanth to consult the good magician Humfrey as to how to bring Jonathan, the zombie, back to life because the ex-ghost, Millie, is in love with him.

Do you get the general idea?

On the plus side, the action is non-stop and the sheer amount of invention is awesome. On the negative side, there is the aforementioned cuteness which extends itself to a rather sniggery attitude toward sex and females that may set some people's teeth on edge. On my part, I'm not unhappy to see lovely Xanth sink slowly in the west.

No, Orson Scott Card is not a TV wag who wrote the national

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anthem. He is an up-and-coming, prize-winning young science fiction writer; and his latest novel, *Hot Sleep: The Worthing Chronicle,* is not likely to do his career any harm, despite its title.

The story is told from several viewpoints; and also uses extensive quotes from future history texts, collage fashion. It still breaks down into two major sections. In the first, we are introduced to a rather dreary future, a human interstellar Empire spread over an unspecified number of planets, most or all of which by their nature confine their inhabitants to enclosed cities. Even worse are the Colonies, just as dreary but more primitive, where naughty people are sent.

The whole society revolves around a drug called somec, which suspends life indefinitely. It is used for interstellar travel, of course, but even more importantly as a plaything for the rich, who extend their lives over many centuries. Due to this, the culture of the Empire has reached near-stasis.

This initial section deals with a complex, wheels-within-wheels plot to do something about this; in other words, a revolution. It results in starship Captain Jazz Worthing taking off with a shipload of somec'd colonists to start a new world outside the Empire.

Up to here I was reminded of the best work of Alfred Bester in its neatly worked out decadent society, revolving around an elite who virtually live forever.

The second part of the book is merely the history of the founding of a world society and its progress from 102 inhabitants to and beyond half a million. Card manages to carry this off with only a few sags; it's a tour de force performance. Particularly interesting is the initial problem he sets Worthing. Somec wipes out the memory on waking, therefore brain content tapes are made before taking it to reindividualize the sleeper afterwards. The tapes for Worthing's colonists are destroyed; therefore, he starts his world with 100 mindless, adult infants.

The author inevitably gets in a bit of sociological philosophizing—who could resist when chronicling the genesis of a society? Luckily, he doesn't overload his story with message.

There is an odd category of SF for which there is no handy term, but it is science fiction written by an author who doesn't know much about science fiction and its conventions. This can result in works as disparate as Aldous Huxley's *Brave New World* and Jacqueline Susann's *Yargo*. The quality can range from the kind of thing that contains ghastly bloopers in logic and knowledge (the use of "intergalactic" for "interstellar," for instance) to a work of some fresh-

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ness and originality.

Movie actor George Nader (star, we must point out, of such SF epics as *The Human Duplicators*) has written a novel called *Chrome* that very much epitomizes this kind of out-of-left-field SF. It's a curious stew concerning an extremely militaristic (here we go again!) future Earth populated by humans and androids co-existing with an extraterrestrial warrior race that may or may not dominate humanity. The dual heros are a Warrior King named Vortex (urgh) and a human cadet, Chrome. But who is human and who is android? Who is really running things? Will Chrome and Vortex be reunited and live happily ever after? (The story is specifically and sometimes graphically homoerotic.)

As science fiction, *Chrome* is for the most part pretty naïve. But Mr. Nader is a better writer than actor (how's that for ambiguous criticism?) and there are ideas and moments here which do have that new and oblique view that an outsider can bring to any field.

A collection of essays on fantasy and science fiction by Ursula K. Le Guin has been published under the title *The Language of the Night*. They are from various sources: introductions to her own and others' books; pamphlets from small presses; and in one case, her National Book Award acceptance speech. A considered opinion of this talented author's thoughts on the fields in which she is so skillful asks for a good deal more space than I have here; it would be sheer hubris for me to try it. However, as a valuable addition to the works *about* SF and fantasy, its publication should be noted.

A most welcome reprint is that of Tanith Lee's *Don't Bite the Sun*. It is that rarest of rare birds, a truly and sophisticatedly funny SF novel, one of the few that have ever made me laugh aloud. Curiously enough, it's a sort of "twilight of mankind" story, of a far future with humanity gathered in a few scientifically Utopic cities that can provide almost anything for their inhabitants. The young people, the Jang, are a rigid social class who spend their time shoplifting, sabotaging things, changing sex, killing themselves, and taking drugs; i.e., not behaving too differently from those of today, but doing it with a good deal more inventiveness, style, and wit (revival after suicide is easy for the cities' science), thanks to Ms. Lee.

All in all, the city Four BEE is something like Arthur C. Clarke's lovely Diaspar (of *The City and the Stars*) gone totally bananas. Our heroine/hero's various adventures in this electronic Bedlam are hilarious, particularly those with a fuzzy, white, six-legged pet she/he

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has filched. Buried beneath, though, is a serious study of coming-of-age, which is concluded in the equally funny sequel, *Drinking Sapphire Wine*.

The worst idea of the year so far, in my opinion, is a "graphic story version" of *More Than Human*; in other words, a big comic book of Theodore Sturgeon's great SF classic. On the most obvious level, it doesn't lend itself to visuals well, with its here-and-now setting and characters whose very point is their surface mundanity. And Alex Niño's big-eyed tots that look like a second generation of those awful Keene kids that haunted every dime store in the 1950s don't help.

On a more general level, is the comic field so creatively poverty stricken that it can't come up with its own original material made for visualization, rather than raiding written literature? I'm not against comics; they can be wonderful fun in a simplistic kind of way; but I resent their diluting stories told in words, in the same way I resent Disney diluting *The Jungle Books* with cute songs.

And finally, it's too bad that SF has gotten to a point where it needs "Classic Comic" versions of its great older works; one of the prides of the field has been its literate younger readership.

My diatribe *re* trade paperbacks at the beginning of this piece did not, of course, extend to art books; pictures need the extra size for full appreciation, and the extra cost is unfortunately justified by the high expense of color reproduction. A splendid example of this genre is a second book devoted to the work of the extraordinary cover artist and illustrator, Boris Vallejo, called, logically enough, *Boris, Book Two*.

In ways, this is more interesting than Book One, which had a rigid format of color painting after color painting. Book Two has more of a scrapbook quality, with many black-and-white drawings and cartoons, some comic work, comments by the artist scattered throughout, and photographs of him from teenaged esthete violinist to body-building maturity (he much resembles his own heroic figures).

And there are color paintings aplenty, not only those in the Frazetta tradition (in which, for my money, Boris has outdone Frazetta at this point) such as the cover (a poster for the New Saint Mark's Baths in New York City, of all things), but less-standard works, several of which are a revelation, seen enlarged from their be-lettered and tiny paperback-cover format. The two for *Z For Zachariah*

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and *A Place Beyond Man* are particularly striking.

There is also an introduction by Philip José Farmer and a checklist of Boris's covers and posters.

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They may find, if they give it a shot,
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That the cosmos is running to pot.

–Jeanne Hopkins

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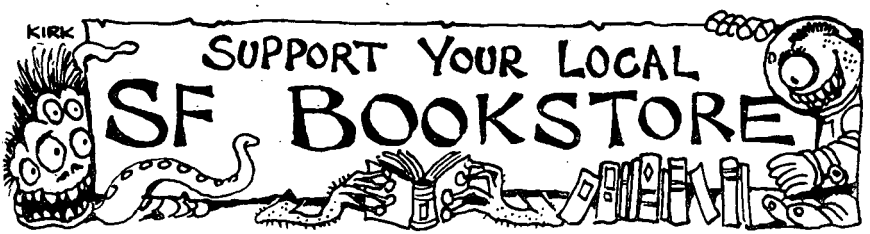

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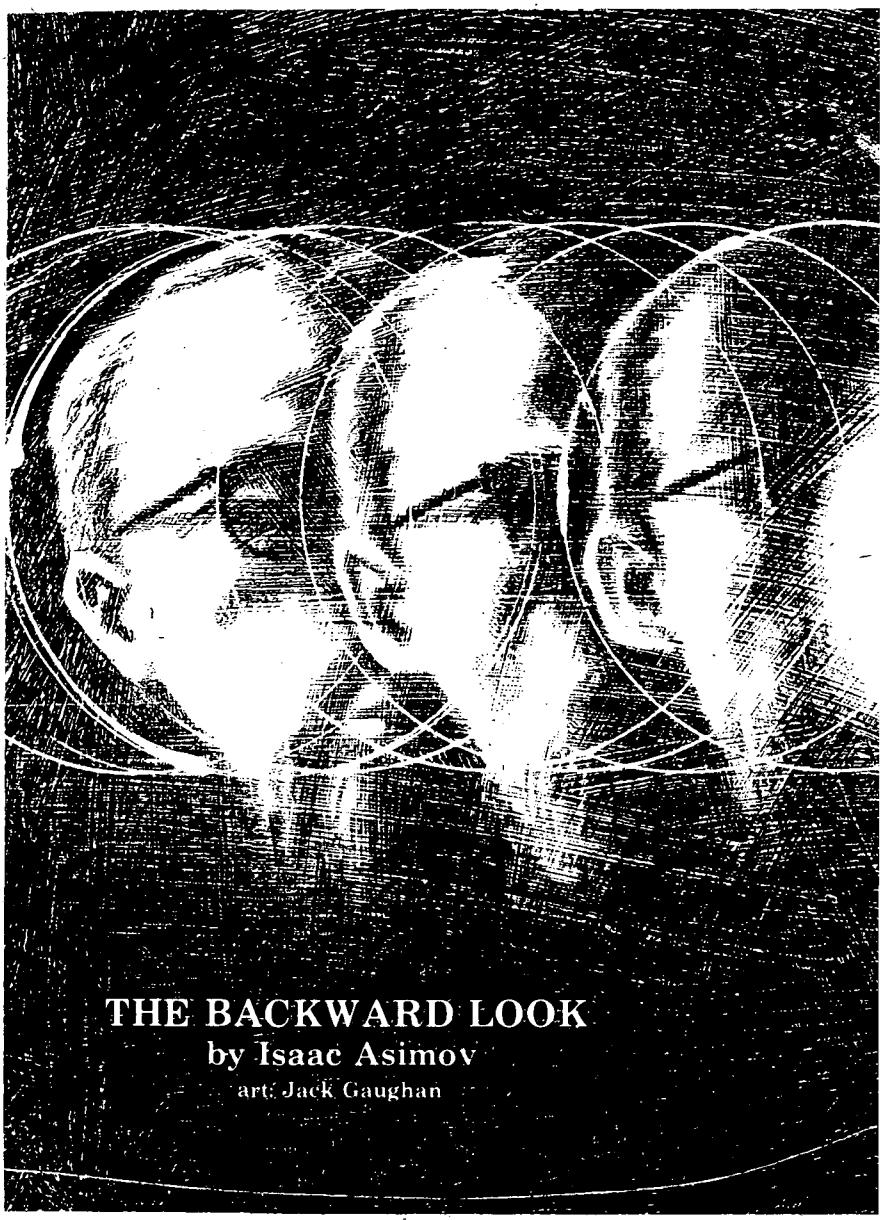

THE BACKWARD LOOK

by Isaac Asimov

art: Jack Gaughan

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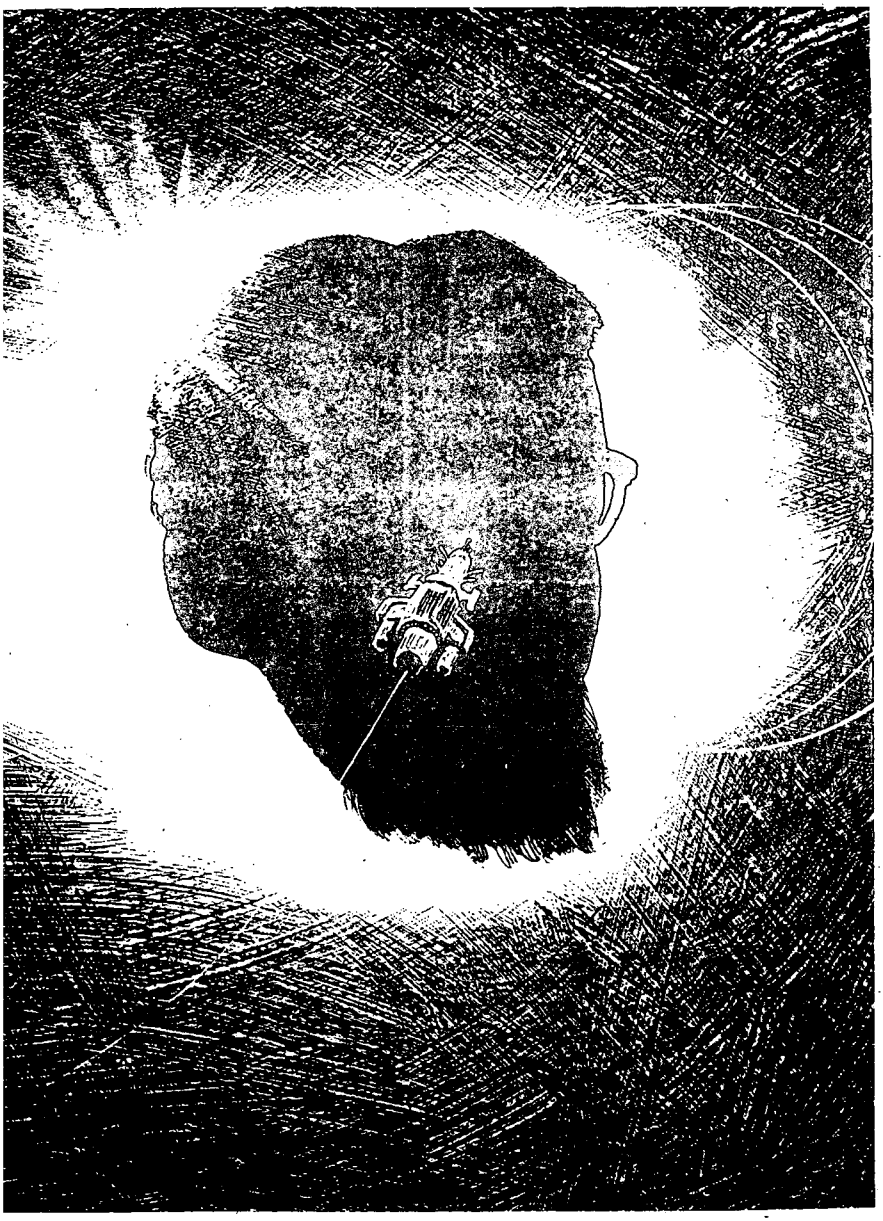

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Not only is Dr. Asimov a member of the Trap-Door Spiders—the organization that inspired these tales of the Black Windowers—but so is the astronomer, Dr. Kenneth Franklin, who straightened out your editor (another member) on a fine point on eclipses during the preparation of this story for the typesetter.

If Emmanuel Rubin knew how not to be didactic, he never exercised that knowledge.

"When you write a short story," he said, "you had better know the ending first. The end of a story is only the end to a reader. To a writer, it's the beginning. If you don't know exactly where you're going every minute that you're writing, you'll never get there—or anywhere."

Thomas Trumbull's young guest at this particular monthly banquet of the Black Widowers seemed all eyes as he watched Rubin's straggly gray beard quiver and his thick-lensed glasses glint; and all ears as he listened to Rubin's firm, decibelic voice.

The guest himself was clearly in the early twenties, quite thin, with a somewhat bulging forehead and a rather diminutive chin. His clothing almost glistened in its freshness, as though he had broken out a brand-new costume for the great occasion. His name was Milton Peterborough.

He said, a small quiver in his voice, "Does that mean you have to write an outline, Mr. Rubin?"

"No," said Rubin, emphatically. "You can if you want to, but I never do. You don't have to know the exact road you're going to take. You have to know your destination, that's all. Once that's the case, any road will take you there. As you write you are continually looking backward from that known destination, and it's that backward look that guides you."

Mario Gonzalo, who was quickly and carefully drawing a caricature of the guest, making his eyes incredibly large and filling them with a childlike innocence, said, "Come on, Manny, that sort of tight plotting might fit your cockamamie mysteries, but a real writer deals with character, doesn't he? He creates *people;* and they behave in accordance with their characters; and that guides the story, probably to the surprise of the author."

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Rubin turned slowly and said, "If you're talking about long, invertebrate novels, Mario—assuming you're talking about anything at all—it's possible for an experienced or gifted writer to meander along and produce something passable. But you can always tell the I-don't-know-where-I'm-going-but-I'm-going book. Even if you forgive it its amorphous character for the sake of its virtues, you have to *forgive* it, and that's a strain and a drawback. A tightly-plotted story with everything fitting together neatly is, on the other hand, the noblest work of literature. It may be bad, but it never need ask forgiveness. The backward look—"

At the other end of the room, Geoffrey Avalon glanced with resignation at Rubin and said, "I think it was a mistake, Tom, to tell Manny at the start that the young man was an aspiring writer. It brings out the worst in him, or—at any rate—the longest-winded." He stirred the ice in his drink with his forefinger and brought his dark eyebrows together forbiddingly.

"Actually," said Thomas Trumbull, his lined face uncharacteristically placid, "the kid wanted to meet Manny. He admired his stories, God knows why. Well, he's the son of a friend of mine and a nice youngster and I thought I'd expose him to the seamy side of life by bringing him here."

Avalon said, "It won't hurt us to be exposed to youth now and then, either. But I hate being exposed to Rubin's theories of literature. —Henry."

The quiet and smoothly efficient waiter, who served at all the Black Widowers' banquets, was at his side at once without seeming to have moved in order to have achieved that. "Yes, sir?"

"Henry," said Avalon, "what are these strange manifestations?"

Henry said, "Tonight we will have a buffet dinner. The chef has prepared a variety of Indian and Pakistani dishes."

"With curry?"

"Rather heavy on the curry, sir. It was Mr. Trumbull's special request."

Trumbull flared under Avalon's accusing eye, "I wanted curry and I'm the host."

"And Manny won't eat it and will be unbearable."

Trumbull shrugged.

Rubin was not entirely unbearable but he was loud, and only Roger Halsted seemed unaffected by the Rubinian tirade against all things Indian. He said, "A buffet is a good idea," patted his lips with his napkin and went back for a third helping of every-

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thing, with a beatific smile on his face.

Trumbull said, "Roger, if you don't stop eating, we'll start the grilling session over your chewing."

"Go ahead," said Halsted, cheerfully. "I don't mind."

"You will later tonight," said Rubin, "when your stomach-wall burns through."

Trumbull said, "And you're going to start the grilling."

"If you don't mind my talking with my mouth full," said Halsted.

"Get started, then."

Halsted said thickly, "How do you justify your existence, Milton?"

"I can't," said Peterborough, a little breathlessly. "Maybe after I get my degrees."

"What's your school and major?"

"Columbia and chemistry."

"Chemistry?" said Halsted. "I would have thought it was English. Didn't I gather during the cocktail hour that you were an aspiring writer?"

"Anyone is allowed to be an aspiring writer," said Peterborough.

"Aspiring," said Rubin, darkly.

"And what do you want to write?" said Halsted.

Peterborough hesitated and said, with a trace of defensiveness in his voice, "Well, I've always been a science fiction fan. Since I was nine, anyway."

"Oh, God," muttered Rubin, his eyes rolling upward in mute appeal.

Gonzalo said instantly, "Science fiction? That's what your friend Isaac Asimov writes, isn't it, Manny?"

"He's not my friend," said Rubin. "He clings to me out of helpless admiration."

Trumbull raised his voice. "Will you two stop having a private conversation? Go on, Roger."

"Have you written any science fiction?"

"I've tried, but I haven't submitted anything. I'm going to, though. I have to."

"Why do you have to?"

"I made a bet."

"What kind?"

"Well," said Peterborough, helplessly. "It's rather complicated—and embarrassing."

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"We don't mind the complications," said Halsted, "and we'll try not to be embarrassed."

"Well," said Peterborough, and there appeared on his face something that had not been seen at the Black Widowers banquets for years, a richly-tinted blush, "there's this girl. I'm sort of cra— I like her, but I don't think she likes me, but I like her anyway. The trouble is she goes for a basketball player; a real idiot—six foot five to his eyebrows and nothing above."

Peterborough shook his head and continued, "I don't have much going for me. I can't impress her with chemistry; but she's an English Lit major, so I showed her some of my stories. She asked me if I had ever sold anything, and I said no. But then I said I intended to write something and sell it, and she laughed.

"That bothered me, and I thought of something. It seems that Lester del Rey—"

Rubin interposed. "Who?"

"Lester del Rey. He's a science fiction writer."

"Another one of those?" said Rubin. "Never heard of him."

"Well, he's no Asimov," admitted Peterborough, "but he's all right. Anyway, the way he got started was once when he read a science fiction story and thought it was terrible. He said to his girl, 'Hell, I can write something better than that,' and she said, 'I dare you,' and he did and sold it.

"So when this girl laughed, I said, 'I'll bet I write one and sell it,' and she said, 'I'll bet you don't,' and I said, 'I'll bet you a date against five dollars. If I sell the story, you go with me to a dinner and dance on a night of my choosing.' And she agreed.

"So I've just *got* to write the story now, because she said she'd go out with me if I wrote the story and she liked it, even if it didn't sell—which may mean she likes me more than I think."

James Drake, who had been listening thoughtfully, brushed his gray stub of a mustache with one finger and said, "Or that she's quite confident that you won't even write the story."

"I *will*," said Peterborough.

"Then go ahead," said Rubin.

"There's a catch. I can write the story, I know. I've got some good stuff. I even know the ending so I can give it that backward look you mentioned, Mr. Rubin. What I don't have is a motive."

"A motive?" said Rubin. "I thought you were writing a science fiction story."

"Yes, Mr. Rubin, but it's a science fiction mystery, and I need a motive. I have the modus operandi of the killing, and the way

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of killing but I don't know the *why* of the killing. I thought, though, if I came here, I could discuss it with you."

"You could *what?*" said Rubin, lifting his head.

"Especially you, Mr. Rubin. I've read your mystery stories—I don't read science fiction exclusively—and I think they're great. You're always so good with motivation. I thought you could help me out."

Rubin was breathing hard and gave every appearance of believing that that breath was flame. He had made his dinner very much out of rice and salad, plus, out of sheer famishing, two helpings of *coupe aux marrons;* and he was in no mood for even such sweet reason as he was, on occasion, observed to possess.

He said, "Let me get it straight, Joe College. You've made a bet. You're going to get a chance at a girl, or such chance as you can make of it, by writing a story she likes and maybe selling it—and now you want to win the bet and cheat the girl by having me write the story for you. Is that the way it is?"

"No, sir," said Peterborough, urgently, "that's *not* the way it is. I'll write it. I just want help with the motive."

"And except for that, you'll write it," said Rubin, "How about having me dictate the story to you. You can still *write* it. You can copy it out in your own handwriting."

"That's not the same at all."

"Yes, it is, young man; and you can stop right there. Either write the story yourself or tell the girl you can't."

Milton Peterborough looked about helplessly.

Trumbull said, "Damn it, Manny, why so much on the high horse? I've hear you say a million times that ideas are a dime a dozen; that it's the *writing* that's hard. Give him an idea, then; he'll still have the hard part to do."

"I won't," said Rubin, pushing himself away from the table and crossing his arms. "If the rest of you have an atrophied sense of ethics, go ahead and give him ideas—if you know how."

Trumbull said, "All right, I can settle this by fiat since I'm the host, but I'll throw it open to a vote. How many favor helping the kid if we can?"

He held up his hand, and so did Gonzalo and Drake.

Avalon cleared his throat a little uncertainly. "I'm afraid I've got to side with Manny. It would be cheating the girl," he said.

Halsted said, "As a teacher, I've got to disapprove of outside help on a test."

"Tie vote," said Rubin. "What you are you going to do, Tom?"

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Trumbull said, "We haven't all voted. Henry is a Black Widower and his vote will break the tie. —Henry?"

Henry paused a brief moment. "My honorary position, sir, scarcely gives me the right to—"

"You are not an honorary Black Widower, Henry. You are a Black Widower. Decide!"

Rubin said, "Remember, Henry, you are the epitome of honest men. Where do you stand on cheating a girl?"

"No electioneering," said Trumbull. "Go ahead, Henry."

Henry's face wrinkled into a rare frown. "I have never laid claim to extraordinary honesty, but if I did, I might treat this as a special case. Juliet told Romeo, 'At lovers' perjuries/They say Jove laughs.' Might we stretch a point?"

"I'm surprised, Henry," said Rubin.

Henry said, "I am perhaps swayed by the fact that I do not view this matter as lying between the young man and the young woman. Rather it lies between a bookish young man and an athlete. We are all bookish men; and, in our time, we may each have lost a young woman to an athlete. I am embarrassed to say that I have. Surely, then—"

Rubin said, "Well, I haven't. I've never lost a girl to—" He paused a moment in sudden thought, then said in an altered tone, "Well, it's irrelevant. All right, if I'm outvoted, I'm outvoted. —So what's the story, Peterborough?"

Peterborough's face was flushed and there was a trickle of perspiration at one temple. He said, "I won't tell you any of the story I've been planning except the barest essentials of the point I need help on. I don't want anything more than the minimum. I wouldn't want *that*, even, if this didn't mean—so much—" He ran down.

Rubin said, with surprising quietness, "Go on. Don't worry about it. We understand."

Peterborough said, "Thanks. I appreciate it. I've got two men, call them Murderer and Victim. I've worked out the way Murderer does it and how he gets caught and I won't say a word about that. Murderer and Victim are both eclipse buffs."

Avalon interrupted, "Are you an eclipse buff, Mr. Peterborough?"

"Yes, sir, I am. I have friends who go to every eclipse anywhere in the world even if it's only a five-percenter, but I can't afford that and don't have the time. I go to those I can reach. I've got a

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telescope and photographic equipment."

Avalon said, "Good! It helps, when one is going to talk about eclipses, if one knows something about them. Trying to write on a subject concerning which one is ignorant is a sure prescription for failure."

Gonzalo said, "Is the woman you're interested in an eclipse buff."

"No," said Peterborough. "I wish she were."

"You know," said Gonzalo, "if she doesn't share your interests, you might try finding someone who does."

Peterborough shook his head. "I don't think it works that way, Mr. Gonzalo."

"It sure doesn't," said Trumbull. "Shut up, Mario, and let him talk."

Peterborough said, "Murderer and Victim are both taking eclipse photographs; and, against all expectations, Victim, who is the underdog, the born loser, takes the better photograph; and Murderer, unable to endure this, decides to kill Victim. From there on, I have no trouble."

Rubin said, "Then you have your motive. What's your problem?"

"The trouble is—what *kind* of a better photograph? An eclipse photograph is an eclipse photograph. Some are better than others, but, assuming that both photographers are competent, not *that* much better. Not a murder's-worth better."

Rubin shrugged, "You can build the story in such a way as to make even a small difference murder-worthy—but I admit that would take an experienced hand. Drop the eclipse. Try something else."

"I can't. The whole business of the murder, the weapon and the detection depends on photography and eclipses. So it has to stay."

Drake said softly, "What makes it a science fiction story, young man?"

"I haven't explained that, have I? —I'm trying to tell as little as possible about the story. For what I'm doing, I need advanced computers and science fictional photographic gimmickry. One of the two characters—I'm not sure which—takes a photograph of the eclipse from a stratospheric jet."

"In that case, why not go whole hog?" said Gonzalo. "If it's going to go science-fictional . . . Look, let me tell you how I see it. Murderer and Victim are eclipse buffs and Murderer is the better man—so make it Murderer who's on that plane, and taking the

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best eclipse photograph ever seen, using some new photographic gimmick he's invented. Then have Victim, against all expectation, beat him out. Victim goes to the Moon and takes the eclipse photograph there. Murder is furious at being beaten, goes blind with rage and there you are."

Rubin said energetically, "An eclipse photo on the *Moon?"*

"Why not?" said Gonzalo, offended. "We can get to the Moon right now so we can certainly do it in a science fiction story. And there's a vacuum on the Moon, right? There's no air. You don't have to be a scientist to know that. And you get a better picture without air. You get a sharper picture. Isn't that right, Milton?"

Peterborough said, "Yes, but—"

Rubin overrode him. "Mario," he said, "listen carefully. An eclipse of the Sun takes place when the Moon gets exactly between the Sun and the Earth. Observers on Earth then see the Sun blacked out because the opaque body of the Moon is squarely in front of it. We on Earth are in the Moon's shadow. Now if you're *on* the Moon," his voice grew harsh, "how the Hell can you be in the Moon's shadow?"

Avalon said, "Not so fast, Manny; an eclipse is an eclipse is an eclipse. There is such a thing as a Lunar eclipse, when the Earth gets between the Sun and the Moon. The Moon is in the Earth's shadow in that case and the whole Moon gets dark.

"The way I see it, then, is that Murderer takes a beautiful photograph of an eclipse on Earth, with the Moon moving in front of the Sun. He has advanced equipment that he has invented himself so that no one can possibly take a better photo of the moon in front of the Sun. Victim, however, goes him one better by taking an even more impressive photograph of an eclipse on the Moon, where, as Mario says, there is no air, with the *Earth* moving in front of the Sun."

Peterborough mumbled, "Not the same thing."

"It sure isn't," said Halsted, who had pushed his coffee cup to one side and was doing some quick figuring. "As seen from Earth, the Moon and the Sun have the same apparent width, almost exactly. Pure coincidence, of course; no astronomical necessity at all. In fact, eons past, the Moon was closer and appeared larger, and eons future, the Moon will be— Well, never mind. The fact is that the Earth is larger than the Moon, and from the Moon you see the Earth at the same distance that you see the Moon when you're standing on Earth. The Earth in the Moon's sky is therefore as much larger than the Moon in appearance as it is in actu-

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ality. Do you get that?"

"No," said Gonzalo, flatly.

Halsted looked annoyed. "Well, then, don't get it. Take my word for it. The Earth in the Moon's sky is about 3⅔ as wide in appearance as the Moon is in Earth's sky. That means the Earth in the Moon's sky is also that much bigger than the Sun, because the Sun looks just the same from the Moon as from the Earth."

"So what's the difference?" said Gonzalo. "If the Earth is bigger, it gets in the way of the Sun that much better."

"No," said Halsted. "The whole point about the eclipse is that the Moon just fits over the Sun. It hides the bright circle of the gleaming Sun and allows its corona—that is, its upper atmosphere—to shine all about the hidden Sun. The corona gleams out in every direction with the light of the full Moon and does so in beautifully delicate curves and streamers.

"On the other hand, if you get a large body like the Earth in front of the Sun, it covers up the shining sphere and the corona as well. You don't see anything."

Avalon said, "That's assuming the Earth goes squarely in front of the Sun. When you see the eclipse before or after midpoint, at least part of the corona will stick beyond the Earth's sphere."

Peterborough said, "Part isn't the whole. It wouldn't be the same thing."

There was a short silence; and then Drake said, "I hope you don't mind if a fellow-chemist tries his hand at this, young man. I'm trying to picture the Earth in the sky, getting in the way of the Sun. And if we do that, then there's this to consider: the Earth has an atmosphere and the Moon has not.

"When the Moon moves in front of the Sun, as viewed from the Earth, the Moon's surface is sharp against the Sun. When the Earth moves in front of the Sun, as viewed from the Moon, the Earth's boundary is fuzzy and the Sun shines through Earth's atmosphere. Does that make a difference that you can use in the story?"

"Well," said Peterborough, "I've thought of that, actually. Even when the Sun is completely behind the Earth, its light is refracted through the Earth's atmosphere on every side, and a red-orange light penetrates it and reaches the Moon. It's as though the Moon can see a sunset all around the Earth. And that's not just theory. When there's a total eclipse of the Moon, you can usually see the Moon as a dull brick-red circle of light. It gleams in Earth's sunset atmosphere.

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"As the eclipse, as viewed from the Moon, progresses, that side of the atmosphere that has just passed over the Sun is brighter, but grows gradually dimmer while the other side grows brighter. At eclipse mid-point, if you are viewing it from a part of the Moon which sees both Earth and Sun centered with respect to each other, the red-orange ring is evenly bright all the way around—assuming there isn't too much in the way of clouds in Earth's atmosphere at the time."

Drake said, "Well, for God's sake, isn't that a sufficiently spectacular sight for Victim to photograph? The Earth would be a black hole in the sky, with a thin orange rim all around. It would be—"

"No, sir," said Peterborough. "It isn't the same thing. It's too dull. It would be just a red-orange ring. Once the photograph is taken the first time, that would be it. It wouldn't be like the infinitely-varying corona."

Trumbull said, "Let *me* try! You want the corona visible all around, is that it, Milton?"

"Yes, sir."

"Stop me if I'm wrong, but in my reading, I've been given to understand that the sky is blue because light is scattered by the atmosphere. On the Moon, where there is no atmosphere, the sky is black. The stars, which on Earth are washed out by the scattered light of our blue sky, would not be washed out in the Moon's airless sky. They would be visible."

"Yes, though I suspect the Sun's glare would make them hard to see."

Trumbull said, "That's not important. All you would have to do is cut an opaque circle of metal and hold it up in the air at the proper distance from your photographic equipment in order to just block out the Sun's blazing disc. You can't do that on Earth, because even if you blocked out the Sun, the scattered light of the sky obscures the corona. On the Moon, there's no scattered light in the sky and the corona would shine out."

Peterborough said, "In theory, that's possible. In fact, it can even be done on Earth on mountain tops, making use of a coronagraph. It still wouldn't be the real thing, though, for it's not just a matter of light scattered by the atmosphere. There's light scattered and reflected by the ground.

"The Lunar surface would be very brightly lit up and light would be coming in from every angle. The photographs you would take would not be good ones. You see, the reason the Moon does

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the good job it does here on Earth is that its shadow doesn't just fall on the telescope and camera. It falls on all the surrounding landscape. The shadow of the Moon can, under ideal conditions, be 160 miles wide and cover 21,000 square miles of the Earth's surface. Usually, it's considerably smaller than that; but generally it's enough to cover the immediate landscape—that is, if it happens to be a total eclipse."

Trumbull said, "A bigger opaque object, then—"

"It would have to be quite big and quite far away," said Peterborough, "to achieve the effect. That would be too cumbersome."

Halsted said, "Wait, I think I have it. You would need something big for the purpose, all right. Suppose there were spherical space settlements in the Moon's orbit. If Victim is in a spaceship and gets the space settlement between himself and the Sun, that would be exactly what he wants. He could arrange to be close enough to have the shadow—which, of course, is conical and narrows to a point if you get far enough away—to be just thick enough to enclose his entire ship. There would be no world-surface to reflect light, and there you are."

Peterborough said, uneasily, "I hadn't thought of that. It's possible."

Halsted grinned, and a flush of pleasure mounted to the hairline he had once had. "That's it, then."

Peterborough said, "I don't want to be troublesome, but—but if we introduce the space motif, it's going to create some problems in the rest of the story. It's sort of important that everything stay on or near the Earth and yet that there be something so startling and unexpected that it would—"

He paused and Rubin completed the sentence for him, "So startling and unexpected that it would drive Murderer to rage and vengeance."

"Yes."

"Well," said Rubin, "since I'm the master of mystery here, I think I can work it out for you without leaving Earth very far behind, just as soon as I get some points straightened out. —You said that Murderer is taking the photographs from a plane. Why?"

"Oh. That's because the Moon's shadow, when it falls on Earth, moves quickly—up to 1440 miles an hour or about 0.4 miles a second. If you're standing in one place on Earth, the longest possible duration of a total eclipse is seven minutes and then the shadow has moved beyond you. That's when the Earth is as deep

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into the Moon's shadow as it ever gets. When the Earth isn't as deep in and is nearer the final point of the shadow, the total eclipse may last only a couple of minutes, or even only a few seconds. In fact, more than half the time, the Moon's shadow during an eclipse doesn't reach the Earth's surface at all; and when the Moon is squarely in front of the Sun, the Sun overlaps it on all sides. That's an 'annular eclipse' and enough sunlight then slips past the Moon to wash out everything. An annular eclipse is no good at all."

"But in the airplane?" prompted Rubin.

"In an airplane, you can race along with the shadow and make the total eclipse last for an hour or more even if it would only endure a very short time on one position on Earth. You have a great deal more time to take photographs and make scientific observations. That's not science-fictional; it's done right now."

"Can you take very good pictures from the plane?" asked Rubin. "Does it allow a steady enough basis for photography?"

"In my story," said Peterborough, "I've got a computer guiding the plane, allowing for wind movements, and keeping it perfectly steady. That's one of the places where the science fiction comes in."

"Still, the Moon's shadow eventually leaves the Earth's surface altogether, doesn't it?"

"Yes, the eclipse track covers a fixed portion of the Earth's surface, and it has an overall starting point and an overall ending point."

"Exactly," said Rubin. "Now Murderer is confident that his photographs taken from the stratosphere are going to include the best views of an eclipse ever seen, but he doesn't count on Victim's having a spaceship. Don't worry, there's no need to leave Earth very far. It's just that the spaceship follows the Moon's shadow *after* it leaves the Earth. Victim has a still longer chance to take photographs, a steadier base, and no atmospheric interference whatever. Murderer is hoist on his own petard for he sees that poor simp, Victim, do exactly what he does but go him one better. He snaps and becomes a killer."

Gonzalo waved both arms in the air in excitement. "Wait! Wait! We can do even better than that. Listen, what about that annular eclipse you mentioned a while ago? You said the shadow doesn't reach the Earth."

"It doesn't reach the surface. That's right."

"How high off the surface is it?"

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"That depends. Under extreme conditions, the end point of the shadow could miss the Earth by hundreds of miles."

"Yes," said Gonzalo, "but could that end point miss Earth by, say, *ten* miles?"

"Oh, sure."

"Would it still be annular, and no good?"

"That's right," said Peterborough. "The Moon would come just barely short of covering the Sun. There would be just the thinnest sliver of Sun around the Moon, and that would give enough light to spoil things. If you took photographs, you'd miss the prominences, the flares, and the corona."

"But what if you went ten miles up into the atmosphere?" said Gonzalo. "Then you'd see it total, wouldn't you?"

"If you were in the right spot, yes."

"There it is, then. One of those annular eclipses comes along, and Murderer thinks he'll pull a fast one. He gets into his stratoplane, goes ten miles up to get into the point of the shadow or just over it, and follows it along. He's going to make a total eclipse out of an annular one—and Victim, the usual loser, does the same thing, except he uses a spaceship and follows it out into space and gets better pictures. What can get old Murderer more torn up than having him play his ace—and getting trumped."

Avalon nodded his head. "Good, Mario. That *is* an improvement."

Rubin looked as if he had unexpectedly bitten into a lemon. "I hate to say it, Mario—"

"You don't have to say it, Manny," said Gonzalo. "I see it all over you. —There you are, kid. Write the story."

Peterborough said, with a sigh, "Yes, I suppose that is the best that can be done."

"You don't sound overjoyed," said Gonzalo.

"I was hoping for something more—uh—outrageous, but I don't think it exists. If none of you could think up anything—"

"May I interrupt, sir?" said Henry.

"Huh? Oh—no, I don't want any more coffee, waiter," said Peterborough, absently.

"No, sir. I mean, concerning the eclipse."

Trumbull said, "Henry's a member of the club, Martin. He broke the tie on the matter of the discussion. Remember?"

Peterborough put a hand to his forehead. "Oh, sure. Ask away—uh—Henry."

"Actually, sir, would the photographs be that much better in a

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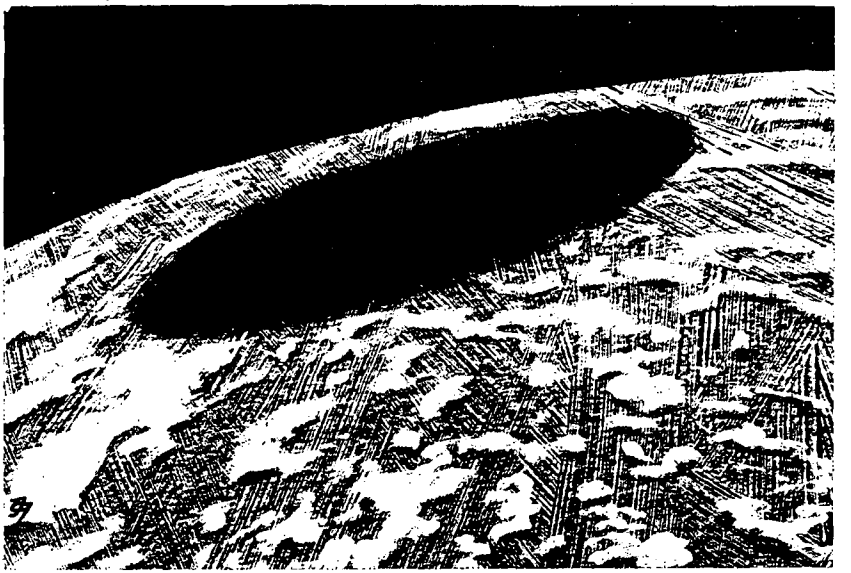

vacuum than in the thin air of the stratosphere? Would the difference in quality be enough to result in murder, unless Murderer was a close approach to a homicidal maniac?"

"That's the thing," said Peterborough, nodding. "That's what bothers me. That's why I keep saying I need a motive. These differences in quality of photos aren't big enough."

"Let us consider, then," said Henry, "Mr. Rubin's dictum that in telling a story one should look backward."

"I know the ending," said Peterborough. "I have the backward look."

"I mean it in another sense—that of deliberately looking in the other direction, the unaccustomed direction. In an eclipse, we always look at the Moon—just the Moon in a Lunar eclipse, and the Moon covering the Sun in a Solar eclipse—and that's what we take photographs of. What if we take a backward look at the Earth?"

"What's to see on Earth, Henry?" asked Gonzalo.

"When the Moon moves into the Earth's shadow, it is always in the full phase and it is usually completely darkened. What happens to the Earth when it moves into the Moon's shadow? It certainly doesn't darken completely."

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"No," said Peterborough emphatically. "The Moon's shadow is thinner and shorter than the Earth's, and the Earth itself is larger than the Moon. Even when Earth passes as deeply as it can into the Moon's shadow, only a tiny bit of the Earth is darkened, a little dot of darkness that makes up, at most, about 1/600 of the Earth's circle of light."

"Could you see it from the Moon?" asked Henry.

"If you knew where to look and especially if you had a good pair of binoculars. You would see it start small, move west to east across the face of the Earth, getting bigger, then smaller, and then vanish. Interesting, but certainly not spectacular."

"Not from the Moon, sir," said Henry. "Now suppose we reverse the positions of the characters. It is Victim who has the airplane and who can get a photograph from the stratosphere. It is Murderer who intends to trump his opponent's ace by taking a better photograph from space—a marginally better photograph. Suppose, though, that Victim, against all expectations, from his airplane over-trumps Murderer in his spaceship."

Avalon said, "How can he do that, Henry?"

"Victim, in his plane, suddenly realizes he needn't look at the Moon. He looks backward at the ground and sees the Moon's shadow racing toward him. The Moon's shadow is just a dark dot when seen from the Moon; it's just the coming of temporary night as seen from the Earth's surface—but from a plane in the stratosphere, it is a racing circle of darkness moving at 1440 miles an hour, swallowing up the land and sea—and clouds, for that matter—as it goes. The plane can move ahead of it, and it is no longer necessary to take single snapshots. A movie camera can produce the most dramatic film. In this way, Murderer, having fully expected to outdo Victim, finds that Victim has captured world attention even though he had only an airplane to Murderer's spaceship."

Gonzalo broke into loud applause, and Trumbull said, "Right on!" Even Rubin smiled and nodded.

As for Peterborough, he fired up at once saying, "Sure! And the approaching shadow would have a thin red rim, for at the moment the shadow overtakes you, the red prominences cast their light unmasked by the Sun's white light. That's it, Henry! The backward look does it! —If I write this one properly, I don't care even if it doesn't sell. —I won't care even" (his voice shook) "if—uh—*she* doesn't like it and doesn't go out with me. The story is more important!"

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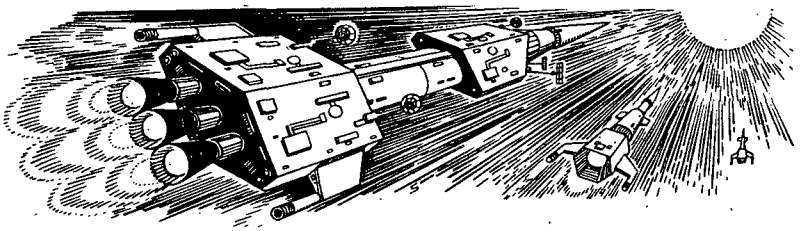
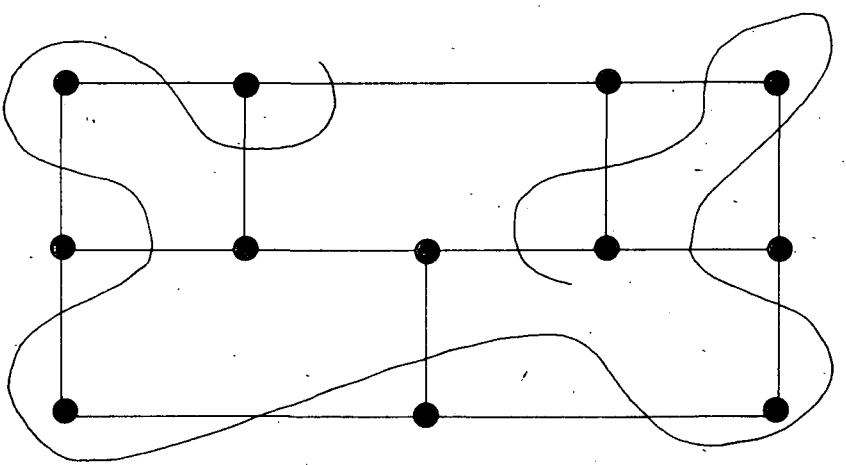
Henry smiled gently and said, "I'm glad to hear that, sir. A writer should always have a proper sense of priorities."



CORRECTION

A key drawing in Martin Gardner's puzzle, "Tanya Tackles Topology" in our July 1979 issue was redrawn by the editorial staff. In the process, an important line was put where it shouldn't have been put. In short, we goofed; and we're sorry. Here's the correct diagram.



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DRACULA MAKES A MARTINI
by Martin Gardner

"It's cocktail time, my love," said Count Dracula to his wife. "Shall it be the usual?"

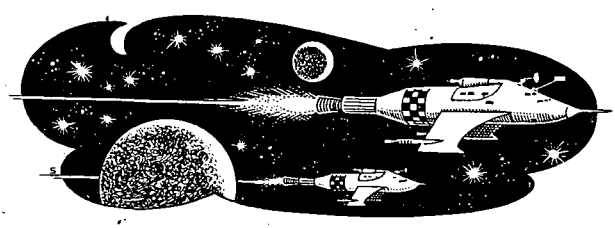
"The usual," said Mrs. Dracula.

The count took from his liquor cabinet a bottle containing one quart of vodka and a smaller bottle containing one pint of human blood. He poured a small quantity of blood into the vodka, shook the bottle vigorously, then poured exactly the same amount back into the bottle of blood. Hence at the finish there was again a quart of liquid in the large bottle and a pint in the small bottle.

Mrs. Dracula was sitting with her back to her husband, but she was watching him in a mirror on the living room wall. The count was following the standard Transylvanian procedure for making a vampire martini.

Assume that when vodka and human blood are mixed, neither alters in volume. After the two operations just described, is there more vodka in the pint of blood than there is blood in the quart of vodka, or less, or are the two amounts the same?

You may have come across this puzzle before in the form of identical glasses, one filled with water, the other with wine. In this variant, however, the contents of the two containers are *not* alike, nor are we told the amount of liquid that is transferred back and forth. See page 61 for the solution.



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THE SF CONVENTIONAL CALENDAR
by Erwin S. Strauss

After the Aug.-Sept. break for the WorldCon, there are a lot of SF con(vention)s coming up. Get out and meet your favorite authors, artists, and editors soon. For a longer, later list, and a sample of SF folksongs, send me an addressed, stamped envelope (SASE) at 10015 Greenbelt Rd. #101, Seabrook MD 20801. If you can't reach a con, call me at (301) 794-7718. If you get my machine, I'll call back. When writing cons, enclose a SASE. If you're planning a con, there's no charge for listing. Look for me at cons as "Filthy Pierre," blowing into a black hose hooked to an accordion keyboard.

SeaCon, For info, write: **Box 428, Latham NY 12110.** Or phone: **(518) 783-7673** (10 A.M. to 10 P.M. only, not collect). Con will be held in: Brighton (near London) England (if location omitted, same as in address) on: 23-27 Aug. The 1979 WorldCon. Guests will include: Aldiss & Leiber. If you don't have reservations yet, better get in line for Laker.

BuboniCon, (505) 821-3953. Albuquerque NM, 24-26 Aug. Orson Scott Card. A low-keyed con. Traditionally, a stopover point for West Coast fans driving east towards NorthAmeriCon.

NorthAmeriCon, (502) 636-5340. Louisville KY. 30 Aug-3 Sept. Fred Pohl, Lester Del Rey and some guy named George Scithers. The continental con, while the WorldCon is abroad.

PghLANGE, c/o Geraud, 1202 Benedum-Trees Bldg., Pittsburgh PA 15222. (412) 561-3057. 28-30 Sept. Gene Wolfe. A relaxed con for fans just recovering from world and continental cons.

OtherCon, Box 3933, College Station TX 77844. (713) 846-9782. 28-30 Sept. G. R. R. Martin.

RoVaCon, Box 774, Christianburg VA 24073. (703) 389-9400. Roanoke VA, 28-30 Sept.

MosCon, Box 9141, Moscow ID 83843. (208) 882-8781. 28-30 Sept. Robert A. Heinlein (health permitting) and Alex Schomburg. Cons are rare in this Empty Quarter of the continent.

NonCon, Box 1740, Edmonton, Alberta T5J 2P1. (403) 469-0719. 5-7 Oct. Gordon R. Dickson and Eli Cohen. Two cons in ten days in the Wide Open Spaces—what's going on up there?

World Fantasy Con, 43 Kepler, Pawtucket RI 02860. (401) 722-4738. Providence RI, 12-14 Oct. F. B. Long, S. King, M. Whelan. The fantasy fan's WorldCon, a tradition after five years.

Sci-Con, Box 6259, Newport News VA 23606. Hampton VA, 12-14 Oct. Kelly Freas. Note the change in Guest of Honor, to David Gerrold (creator of Star Trek's tribbles).

MileHiCon, Box 11545, Denver CO 80211. (303) 433-9774. 26-28 Oct. J. Williamson, C. Stubbs.

AcadianaCon, 815 E. Railroad, Broussard LA 70518. (318) 837-1769. Lafayette LA, 26-28 Oct. David Gerrold. The emphasis will be on Cajun food, music and culture. Sounds intriguing.

Roc*Kon, Box 9911, Little Rock AR 72219. (501) 568-0938. 26-28 Oct. Gordon R. Dickson.

MapleCon, Box 2912 Sta. D, Ottawa, Ont. K1P 5W9. (613) 236-5658. 28-30 Oct. Harry (The Stainless Steel Rat) Harrison. Halloween weekend is a popular date, with 4 cons planned.

NovaCon, contact SeaCon (above). Albany NY, 2-4 Nov. Wilson Arthur (Bhob) Tucker and Bob (Bosh) Shaw. "The first British con in the US." Free to holders of UK/Eire passports.

ConClave, c/o EMU SFS, 117 Goodison, Ypsilanti MI 48197. Detroit MI, 2-4 Nov., 1979. A. E. (Slan) Van Vogt. Another intimate Michigan con. What's a "Drunken Spacewoman" party?

NorEasCon II, Box 46, MIT PO, Boston MA 02139. 29 Aug-1 Sept., 1980. Damon Knight, Kate Wilhelm, and Bruce Pelz. The world SF Convention for 1980, back in Boston after nine years.

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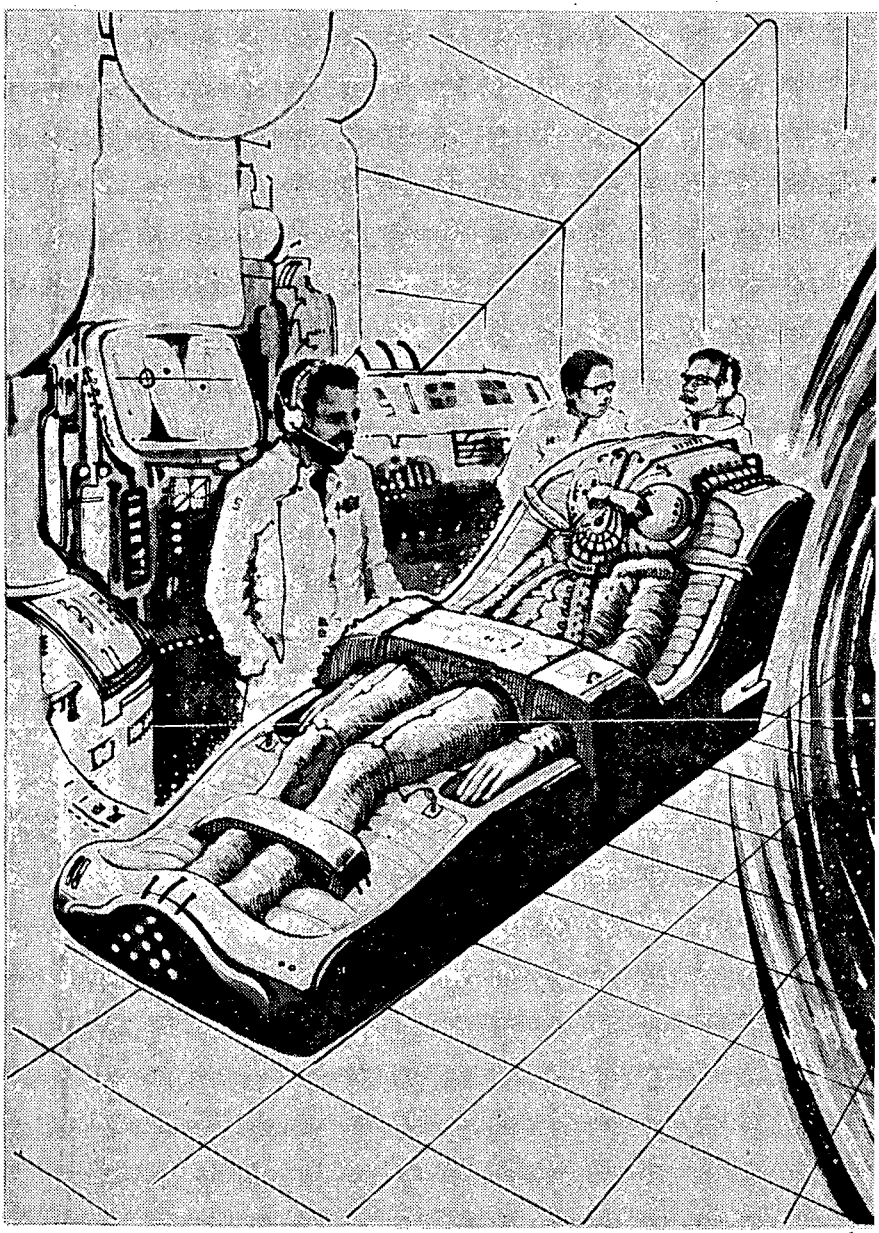

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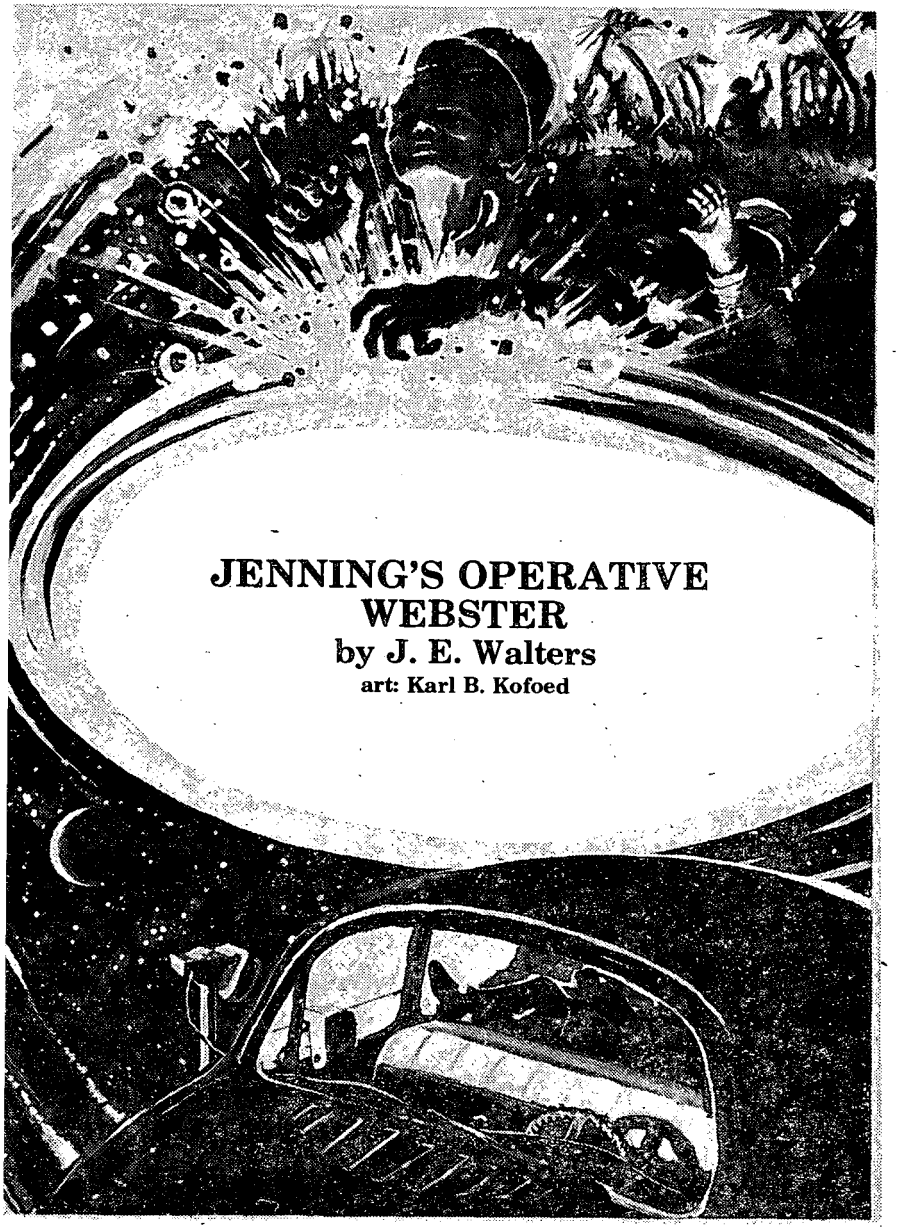

JENNING'S OPERATIVE WEBSTER

by J. E. Walters

art: Karl B. Kofoed

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Mr. Walters tells us that he is five feet six and 205 pounds, has blond hair, and needs glasses to find his glasses. He was born in McCook, Nebraska, in 1947, spent a five-year hitch in the Navy, and now lives near Denver, Colorado, where he works for Western Electric as an electronics technician. He reports that he wrote the first draft of this, his first published story, in six hours; the rewrite took a whole week.

For all the world, the old man looked to be a derelict. He hadn't shaved in at least a week. The sweat shirt was holey and needed washing. The knees were gone from the jeans, and they had cuffs nearly three inches high. I know it surprised me when he laid the twenty-five hundred on Jenning's desk. I'd bet Jenning was surprised too, but you can never tell about the boss.

Counting it out, Jenning continued to talk with the old man. "Yes. Yes, Mr. Courant. Do pardon my asking, but how did you come by this money? Nothing illegal, we trust. No slur intended, but your clothing led me to believe you were a bit down on your luck."

The old man had a poker face, or one that hadn't had anything to smile about for so long that the frown was a permanent fixture. He replied, "I got it. That's the amount you asked for."

Jenning had finished counting and had formed the bills into a neat pile on his desk. "Indeed, Mr. Courant, you've supplied us with the retainer. I take it we can assume you've funds to cover the total amount if we are successful."

"If?" For the first time in the ten minutes I'd been in the room with them, I saw a trace of emotion in that old face. "If! I thought that . . . I thought it was assured you could—you'd be able to do it."

"No, no; I'm sorry to say we can offer no guarantees. The fabric of time is a delicate, almost whimsical thing. Our success rate runs at nearly eight-two percent, and within the industry that is an enviable rate. But we just can not guarantee success. That, Mr. Courant, is why we do not require the total amount up front. The retainer covers our expenses, initial survey, et cetera. If we are successful, the amount in total comes due. If we fail, you may forfeit all, or part of the retainer."

The old man said only, "Oh." But his shoulders had dropped an

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inch or so, as if he'd caved in on himself. I've always wondered where Jenning gets that percentage figure from.

"Now Mr. Courant, don't be disillusioned. Eighty-two percent, Mr. Courant. Eighty-two times out of a hundred we can make the desired alteration. Eight hundred twenty out of a thousand. There's certainly no reason to think you won't be numbered among our successes."

"I'd thought it . . . I'd hoped it could be guaranteed."

"No, Mr. Courant, we do not guarantee. No reputable firm can. There are too many variables. Rest assured I and my highly trained staff will do our very best. Depending on your instructions, we'll make as many attempts as we can within the limits of the retainer. But we can not guarantee the outcome."

"I could get more money."

"Well, Mr. Courant, that might help the percentages. But until we get full particulars and an operative in the time stream, we've no way of knowing what we're up against. In some cases, if we feel further attempts are warranted, we can take a larger retainer."

The old man just sat there, looking down at a hole in the tennis shoes he wore.

"And by the same token, should we be successful in the first or second attempt, we refund the retainer above our actual expenses. The remaining seventy-five hundred is still due us, and let me assure you the profit margins involved are minute indeed. After all, how do you place a money value on a son taken before his time?"

God, how I hated Jenning when he went into that routine. The old man kept staring at his shoes, finally asking, "The retainer, how many times can you try on that amount?"

"Usually two, sometimes three. Here again, it depends on conditions, and we can guarantee nothing beyond trying our best."

Jenning let him sit there for a few minutes. I could see the old man moving his toes beneath the canvas of his shoes. Toes curling, the same motion again and again.

Jenning finally made the push, "Mr. Courant, our time's just about up. I don't want to seem to be pressuring you into a hasty decision, but I've other clients to meet with. Operative Webster there has obligations too."

I put on my famous world-winning smile, but the old man never even looked at me in my corner.

"I've never been pressured in this," the old man said. "I wished. I hoped. I knew someday science would be able to help me. I

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began putting money away when I first heard about companies like yours. When I had enough, I came to you."

The old man looked up from his shoes then, straight at Jenning. "Do it. You got to succeed." He paused, "I want to increase the retainer."

"Yes, Mr. Courant. I do understand. Really I do. But it would not be ethical to take more than the standard retainer until we get Operative Webster briefed and into the stream. A lot depends on his findings."

The old man finally noticed me, and I tried to look very competent.

Jenning lifted the stack of bills and neatly deposited them in his desk. Then he held out a hammy hand to Courant, who weakly took it. They shook on it.

"Well, Mr. Courant, I'll turn you over to Webster here. He'll have need of a great deal of information from you. Some of it will be of a personal nature. I'd recommend you answer as forthrightly as you possibly can, remembering that some minute fact could mean the difference between our success or failure."

On cue I stood and crossed the well-padded carpeting to stand at the old man's side. The man stared up at me, and damned if his eyes weren't the saddest I've ever come up against. In my line, you can't let yourself get too involved, or you're headed for a super downer. But after looking into those eyes, I knew I'd have to give this one a lot of effort.

I helped the old man up and got us headed for the door. Jenning was moving at his desk; and I knew as soon as we left, the money would be stuffed in the company safe.

Jenning may be a hell of a scientist and a co-holder of a Nobel Prize for the time machine, but sometimes I really wonder how much of a human being he is.

Casually I led us towards the commissary for coffee, on Jenning I might add. Over the cups, I began digging for the information I needed. Once I got the old man talking, he had a pretty sad story to tell.

"We raised him good, we thought. I was twenty and Beth was younger, when we married. Willows, little town west side of Nebraska. Lived in an old stucco house. Worked for the railroad. It's been a long, long time."

I just sat back and listened to it, keying on the words.

"Ronald Benjamin Courant, my little towheaded boy. Only one Beth and I could ever have. We really loved him.

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"I can't explain it. Hell, all the things that have gone wrong with the country since then, and I'm embarrassed to say we brought him up to love the country. I don't know, I was in high school when the second war ended, and pride swept the nation. I was proud to be raising a son that would . . . do great things. Maybe even be president someday. Sounds stupid, doesn't it?"

"No. It sounds like any parent who loves his son." I could have said more, but it's not my part in this to point out contributing factors. I'm here to set things right, and that's all.

The old man sipped at the coffee and went on, "I can remember telling him it was 'his country, right or wrong.' Oh, how I want him back."

His shoulders moved in great sobs, but there weren't any tears. Cried it out long ago, I'd guess.

"It's hard for me to bring the memories back. I'd locked them away."

"Yes, Mr. Courant," I soothed. "I've got to know, though. We can't get into this without details."

He leaned back in the chair and crossed his arms on his chest.

After several minutes of silence, he began again, "I—I suppose I'm to blame in it. If I'd been more critical of the country . . . but we just didn't do things like that then. He was barraged by it at school, but we talked it out at home.

"The day he graduated, he enlisted. I was proud. My son was to be a Marine. I . . . I'd never served, but I was proud of him. We were active in Vietnam then, and I'd been brainwashed to think that democracy would collapse if that country fell.

"That must sound silly to you. I mean we're still here. I was nearly forty years old then, and it all made sense.

"He died over there, near some town that I can't even pronounce. Threw himself on a grenade. Saved another boy's life. We got the telegram, the medal, the flag, and what was left of our son's body."

He began rubbing his forehead, stroking it with his hand. "Beth, she took it hard. I had to be strong. It was so hard. I wanted to run off and cry. Our only son was dead, and there was something gone from our life, and it couldn't be replaced.

"Beth changed. And maybe I changed too. We grew apart, until we couldn't stand one another anymore. I guess we still cared for each other, but I guess we blamed it on each other too."

He sighed, "We separated, and I don't even know if she's alive or what."

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I looked at him, and felt sorry for it all. A good briefing, but I needed more. "Mr. Courant, I know this is difficult for you, but I'll try to explain why I need this information.

"We look at time as a river flowing capriciously between high and low lands. Every living being has an influence on the stream. Every living being is a portion of the stream. To find the boy, I've got to be able to immerse in the part of the stream that was his.

"I hate to put you through this. I'm not a cruel man by nature. But I've got to know more. I've got to be able to pinpoint his flow if I'm to succeed."

He looked at me with those saddened eyes.

"I need more information. Describe the house in Willows. Tell me about raising the boy. Tell me about Elizabeth, Beth. Did he have any girlfriends?" I moved to the coffee dispenser, and had to speak a little louder.

"Parts in a school play. Pets. Buddies. His hobbies." I pulled the mug from the dispenser and took it back to the table.

"Everything and anything. I must know as much about Ron as you can tell me."

I refilled his cup from the coffee mug.

"The more information you can give me, the better our chance of success."

He began sipping at the coffee. And I readied myself for a long day. My pocket recorder took it all down.

Next morning finds me plopping myself into the chaise and letting the techs grease my head down. That grease is going to make me bald someday. Wonder if that qualifies for workman's comp?

The time machines (we've got two) are used on a shared basis by all the operatives. It's about twenty after eight A.M., and I'm scheduled in for a two and a half hour time block. That ought to wipe out the old man's retainer. Can't be helped.

I can't really explain it, this time travel. You see things, it seems real, and it is real. It's your mind that makes them hard to believe—that what's like real life happened years ago.

Viewpoints shift from person to person, and it's a real trip seeing how differently people see things; how different the colors seem, and textures. Or you can focus on just one person; and if you've had the training, can actually take possession of their body. You don't appear physically, as in one of those sci-fi things. Really neat!

Jenning does it with the machine and keeps a real close guard

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on the schematics.

We start with a skim session. People's memories fuzz up on them as time passes. What I do is take all the basics the old man gave me and concentrate on a person, place, or time. From there, the machine takes over. Meanwhile Jenning runs my report, transcripts of my pocket taper, through his computer to check on flux points.

Flux points are what he calls them when he's not speaking *scientific* to his staff, anyway. He's hung up on flux points. Says they're areas of the time stream that we can't change. He never says what happens if we change one, but he's adamant about the prohibition. We can't even come close to one.

The techs drop the bands over me and then the helmet. Then they leave, and it's just me and the machine. It kind of crosses your eyes when they first turn it on and makes you a little dizzy. It's not too bad when you're just skimming. It's a little worse when you actually drop into the stream. You can live with it.

Skimming's like inner-tubing, in some ways. You float with the stream and just try to get a feeling for where would be the best place to try to influence the stream.

Whooee, there it goes. They've turned it on. In another second or so I'll. Uh, I'll . . .

I see . . .

A family, it is. A young man and woman, on a porch swing. Swinging back and forth. There's a boy, small and well-scrubbed in a sailor suit, between his parents. Back and forth they go.

A summer evening, and I can smell lilacs there. And I can hear a river softly near. Crickets and a bird calling from somewhere.

Street sounds, but small town. A game of baseball in the street, beneath street lights. A dog barking. Other things. Pleasant, peaceful things.

No, not here. Even if it would change the outcome, I don't think I'd want to change this. I leave it behind, and drift on.

The boy's older here, in this eddy. High school baseball team. Blond, well-tanned, well-built boy. A grounder to third, where he plays. He runs up on it rapidly, fielding it like a professional, and throws wide to first. Embarassment and anger. Got to do better than that. Folks and Mary Lou watching. Got to do better.

I sense something here. The hard round ball, grenade-like. This might be the place to try. Can't be sure. Can't know until I've seen it all. Can't decide until then. On, and down stream just a little.

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She's pretty in her way. Black hair. Glasses. Mary Lou then. Young bosom, not as big as she'll be in a year or two. It's night, and the porch light reflects off newly fallen snow. Senior or junior prom. He wants her.

Damn, I'm losing this to the current. Something happened here that shoved him onward, and I can't buck the flow. I don't know how useful this will be, but I'll almost have to try here. He wants her, and if I can get them married . . . Well, a married Marine would probably avoid Vietnam.

It's gone. The current moves, and I move with it.

San Diego, warm town. Boot camp. DI's. Serial number, must be memorized. Cadence counts, obscene and ludicrous, obscenely ludicrous. Short, tanned Mex. Sergeant Sanchez. "You bunch a squirrels. What you doing playing in my sand?"

Obstacle course. Oh God, the obstacle course. Just can't make it. Got to! Have to try. Pride in self. Pride in country. Got to try.

Relief. Over with. For real orders. Nam. Camranh Bay, and farther in. More training. God, don't want to die, for sure. But want to go, want to serve.

Leave. Folks. How proud they are of me. How proud!

The current's very strong here, and the events are passing rapidly. I see Mary Lou, but there are no clues to that mystery. Sergeant Sanchez is an ally. They're definitely worth a try.

It rages now, and I feel the humid heat of summer. Leaves, broad and tangled growths. Shots, and the squad leader goes down. Blood on my hands. Oh God oh God he's dead. He's dead in my arms. More shots. They're coming. Run. Run!

Hard to breathe. Hard to keep going. More shots. I see leaves dancing to bullets. Hide. Cover. Mortar crater. Me and Tommy. Down low. Tommy's hit. Shots crashing above. Me and Tommy. God. God!

It rolls slowly into the crater and lies there. Nearly round and designed to fragment. Grenade. Death. Save Tommy. I jump on it. No. Lord no. What have I done? No. No!

I scream, and feel the pieces bursting in my belly. And then the blackness. The terminus.

The current carries me on, but there is nothing but the blackness. Minutes of this darkness pass before the techs raise the helmet and remove the bands. I wipe sweat from my face and blink to wash the sting from my eyes.

Thirty minutes have passed. Well-spent, really. More detail than the old man gave, and I'm smiling because I know the boy

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didn't throw himself on the grenade without regretting it. Yes, there's a chance here.

Jenning pops into the room with a pile of computer sheets. I give him a run-down on the skim session. He listens intently, periodically digging a sheet from the pile to study. I've seen the sheets before, but haven't any idea what Jenning picks up from them, other than his precious flux points.

I'm finished, but Jenning's still working over the sheets.

He wants to know, "What's your approach plan?"

"Well, I figured on Mary Lou. They were in love at first. If I can get them together, I might be able to keep him from enlisting."

"Yeah, that sounds good. Give any thought to the baseball bit?"

"Sure, but I'm hesitant to get involved there. Have to teach a natural fielder to run away from the ball, because one day it turns into a grenade. No, take too much time."

"Good point. How about the DI, Sergeant what's-his-name?"

"Yeah, I figured there for sure. A lot of variables there, but feel it's best procedurally to keep him out of the Marines if I can."

"Uh-huh." He's flipping through the sheets rapidly now.

"Mr. Jenning?"

"Yes."

"Think it would be worthwhile to skim some more, try to eddy in on the Viet who threw the grenade? Maybe try to influence him a bit?"

"Uhm, don't know. You said the boy reflexed on the grenade?"

"Yes sir, pure reaction. If he'd had a chance to think about it, he'd have run."

"That's in our favor."

"Yes, it sure is."

"I don't know, Webster. Flux density was pretty high throughout the latter parts of the Vietnam thing. We've no way to find out much about the Viet who tossed the grenade. Skimming him would probably be a waste of effort. Besides, without a name and particulars I can't work up a computer simulation on it."

"Okay, we'll drop that."

He anticipates me, "And no, we can't do away with the Vietnam war. That's a prominent flux point, a real standout."

I could have figured that out. Jenning can get under your skin at times.

"Any reason why you don't want to try the terminus first?"

"Yeah, there is," I tell him. "I'm not sure I could get him far enough away from the grenade to get him back whole. Your

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charts should have . . ."

"My charts, Webster, deal with events and not any single person. Events, Webster, I do wish you'd remember that."

"Yes sir." I need the job. "I'm sorry."

"Sometimes you operatives act as if I'm trying to run the whole thing. That's not true. I give you people quite a bit of leeway in how you handle things."

Better be ready to explain when you fail to get a job done the way he wants it.

"My concerns have always been to avoid upsetting the apple cart, if you will. It can be tilted, but only so far. Flux points, Webster, are what matter."

I can see right now he's headed for another lecture, and I'm not willing to stand around and listen to it. Not on the old man's time. Not even on my own time.

"If I can get him *involved* with Mary Lou," I'm changing the subject, "I stand a good chance to succeed."

"Yes, makes sense."

"Then Sanchez."

"The sergeant. All right, if you've time. I rather doubt that Mr. Courant could really afford to increase the retainer."

"And then the terminus."

"Sounds good. You've about an hour fifty left. Good swimming."

I watch him gather up the printouts and leave. Yeah, he makes me a little sick too.

The techs are standing by, and in a couple of minutes, I'm tucked back into the machine. I watch them leave. Never thought about it, but what in the hell do they do for the hour fifty I'm tied in the chaise?

Now to recall Mary Lou, you sexy young thing you. Black hair, perky face. Glasses, you don't see them much anymore. Teenage girl. Young. Just beginning to know what being a woman's all about. Heck of a boy friend in Ron Courant. He plays baseball. Star of the team.

Damn it, the machine's hitting me in the stomach. I should have had something to eat for breakfast, but too worked up.

Feeling the stream now, and need more specifics. Well, let's see. Boy and girl. Had to be a car. Had to be a drive-in movie sometime. Ok, Mary Lou. I've got you. Yeah, and the car too. Oh rats, it's a Volkswagen.

Have to get Mary Lou in the back seat, both figuratively and literally. Need to move her karma around a bit. Stuff it someplace

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out of the way for a little while. Glove box is a good place. Pushing karmas around is not too hard, not after working for Jenning a while.

Settle in now. Kind of kinky being in a young thing's body. I'm always tempted to sneak off and play with herself. Must persevere, greater things at stake here than my own perversions.

There, then. In and settled. He's in the driver's seat, and rubbing my neck with his hand. That does feel good. Both were halfheartedly watching a B movie, and now only he is. Well, it's turn-on time.

"Ron," I say. From the way he jumps, I'll have to change the voice a bit. "What'd you jump for?"

"Uh, you sounded funny. Almost like a man, or something."

"Oh. I thought you'd noticed I was a girl by now."

"Heck, Mary Lou, I'd noticed that a long time ago." He gestures with his hand and knocks the speaker off the window. In trying to pick it up off the floor, he whumps his head on the steering wheel and the horn sticks. I'm beginning to doubt Mary Lou's taste in boys. I certainly was never this inept. The ineptness tells me much about their relationship.

Getting back in after pulling the horn wires for him, I tell him, "Well, that's taken care of for a while." I rub her hands together.

"God, that was embarrassing," he says.

I say, "We'd be more comfortable in the back seat."

"Uh, well. Sure. I guess. If you want."

"I want." And I lick my lips. And I smile a wicked smile.

"Uh, gee. Maybe we'd better stay up here. The bug's got such small windows. It'd be hard to see the movie back there."

"I know," I pant, and glom on to his arm. "Ron, dear Ron." I've maneuvered close by this time, very close. I've managed to press certain parts of Mary Lou tight up against him. And judging by the way he's breathing, it has been noted. The pain is killing me.

I've decided that the shifter and emergency brake of a Volkswagen are in a very poor place. There's an imperative about the back seat now. I coyly suggest it again, "Let's get in the back seat."

"Uh, okay."

We move to the back seat.

A few more amenities. A kiss. Another, a little wetter. One downright sloppy one. A few selected nibbles on the ear. Everything I've always wanted a gal to do, but was afraid to ask.

"Mary Lou, uh.

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"Mary Lou?
"Mary Lou!
"We can't do this here, Mary Lou.
"Someone will see.
"Mary Lou!
"You can't do this in the back seat of a Beetle."
I reply, "Oh, I know a way."
"Mary Lou.
"Mary Lou!
"Mary Lou!!"

Something's gone very wrong. Ron's climbing out of the car, trying to get his pants zippered back up again. He's . . . he's walking to the exit. What in the hell?

Mary Lou's essence is rattling around in the glove box. I shut her up and close her blouse. I need to figure out what went wrong. I screwed this up someway. But I'm damned if I know how. Nothing I'd picked up on Ron made him out to be homosexual. I may have pushed a little hard, but I'm under time pressure. Maybe I better let Mary Lou have her body back, and skim her way a while.

I interchange and begin the drifting. I pass some of my recollections her way, but nothing she doesn't need to know about tonight. She's crying now. She's hurt, "All right for you, Ron. I don't need you." She yells after the departing figure, "I don't need you. I don't want you."

Rejected, hurt, confused by her own forwardness tonight, she drives home and cries herself to sleep. A few lonely days. A few futile attempts to talk to Ron. Then she (and I) begin to hear the rumors. Ron's got a big mouth, I learn. A date now and then, but never with goody-goody, big-mouth Ron. So what, don't need him. Other friends. Others.

I figure it out, eventually, as the succession of *others* begins flowing rapidly past. And that, gentle folks, is how I gave Mary Lou her bad reputation.

You're a puke, Ron, and so am I. I've got to help you, even if I've lost a little of my drive. I surface, throwing the helmet and bands off.

Nine-forty and buckled in place. I crammed the breakfast down, and I'm beginning to get a headache.

Okay. Okay, get going. Only got an hour left. Sanchez. Got some vivid recollections of the DI. Mean. Vocabulary that's bad,

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even for a Marine. *Clink,* didn't feel a thing when they turned it on. Maybe these headaches do have a use after all.

It's a large foxhole, and Ron and Tommy are there leaning on their shovels. Sarge's yelling at them. Not much karma to move aside, appears DI's don't have much. Not charitable, really. Sanchez cares in his own way. Maybe, maybe I won't have to—but no. He has something else in mind. What I need is more along this line. Yes, yes!

"Shit! What you squirrels doing leaning on them shovels? I don't remember inviting you to lean on them shovels. What the hell you doing in my hole?"

The two fatigued Marines, both meanings, scramble out of the hole. Sanchez steps into the hole. I make him look around.

"You like this hole?"

"Yes sir."

"Did I just hear a bee belch, or was you two talking at me?"

"Yes sir!"

"You know, I like this hole too. It's a nice hole. You know what I don't like? I don't like looking up at you two squirrels. I don't like that at all. You two squirrels get back down in this hole."

"Ah, shit," I say. "Now look what you done. You got my hole all crowded. I'm going to have to get out. You want me to get out?" I quickly raise his finger and glare at the pair. "You better not say a damn thing, you know what's good for you." I climb out.

I look down at the two and ask, "Hey you, blondy. Yes, you. You like him?" I point from Ron to Tommy.

"Yes sir," says Ron.

"And you, you like him?"

"Yes sir," says Tommy.

"You two buddies?"

"Yes sir."

"Uh, you two don't love each other, do you?"

"No sir!" They grin a little, but not for long.

"Hokay. I going to play a game with you. You like to play games?"

"Yes sir."

"Good, cause it's a good game." I take off the sergeant's hat. "You like my hat?"

"Yes sir."

"Good. I like my hat too. It's a nice hat." I toss it into the hole. "Hokay, now we going to play. Is that my hat, what in your hole?"

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"No sir."

"Hey, you guys getting smart. Hokay, if that ain't my hat, what it is?"

They look at one another, not knowing what to say.

I scream, "Shit, that's a *hand grenade.* What you going to do, blondy? What you going to do!"

Ron's body stammers, then he stoops, grabs, and throws the hat out of the hole. I explode, jumping up and down, "What in hell you mean, throwing my hat around. You get my hat, and you better do it quick."

Ron rapidly retrieves my hat. I look it over, then toss it back in the hole. "Hey, blondy; you play baseball?"

"Yes sir."

"I knew it. You think you can toss a live grenade around like John Wayne? You hold up you right arm."

Ron raises his right arm.

"You better kiss you arm so long, you going to play John Wayne.

"You going try again, blondy." Ron starts to move toward the hat. "Ah," I say. "You ain't thinking to jump on my hat?"

"Uh, no sir."

"Oh, that's good. Cause I make you sorry you ever born, you done that. So what you going to do?"

Ron throws himself out of the hole. I growl at Tommy, who then repeats Ron's action.

I beam, "Now you guys making me proud to be a Marines." I saunter down into the hole and pick up the hat. Dusting it off, I casually walk on top of Ron on my way out. Well, he deserved it.

I put my worst scowl on and yell at them, "And damn you, you better remember what I learn you today!"

I storm away and give Sanchez back his body. I'll let him figure out how the hat got dusty.

Submerged in the stream, it's hard to keep track of time, but I'm afraid my time with the machine's passing fast. I surface, then skim. Drifting into the steamy paddies, into the jumbled woods.

Again the squad leader dies in his arms. Again the bullets flipping into the trees. Damn it. God damn it! He jumped on the grenade again.

Almost before he's dead, the techs pull the bands. I don't want it to end like this. I can't let it end like this.

Jenning's there and tells me there's only a half hour left. I give

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him an edited version of events. What he don't know shouldn't hurt me.

He says, "In the short time we've got left, we've no choice but to concentrate on the terminus." He shakes his head, "I've never figured out why in some cases it's so easy to swing the stream. In others, it's like trying to—count the stars."

Yeah, it is. You could probably do it, but the effort and time involved would make it hardly worthwhile. His comment also serves to put the limit on our efforts for the old man. Succeed or fail, I've got just a half hour to do it in.

Someplace Jenning keeps a record. And that record carries the time blocks available after I finish, all filled. He runs things close, with an efficiency that's hard to comprehend at times. It's as if he really didn't care about the people. Hard to understand the boss. I guess it's just a thing that his position has caused, like an ulcer.

I move back to the chaise, and the techs hook me back in. Like an ulcer.

I've sort of mucked this thing up, and I'm not happy about that. I knew I was too involved in this. I should have asked Jenning to get another op on this one. Hell, I've got to try to straighten this out. Dumping this on another op now would be a really rotten thing to do.

And I'll have to explain it to Mr. Courant. Jenning will see to that.

Ok. Focus on Ron. Focus on the minutes. Pick him up with the squad leader in his arms. Control. Yes, control. Self. Preserve the self.

Fight him. Fight it.

Self, the all important I. Running. Running out of breath. It's hard to breathe. See the leaves moving. Not the breeze. They're all around you. Run. Run!

Yes, run *past* the mortar crater. No place to hide there. No place at all. Run.

God. God oh God! The pain burning into my back as the bullets enter. I'm hit. I'm hit! Down into the blackness.

No. Damn it, no! Surface and do it again.

One attempt made. One failure. Back to the squad leader in my arms.

Fear. He's dead. They come. Protect yourself. Protect yourself. Yes, run.

Running out of breath. Leaves moved by bullets. Hard to

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breathe. Hard to breathe.

Mortar crater. Yes, there. But don't stay. *In and out.* Trap there. *In and out.* Tommy in behind. *Sergeant Sanchez.* Remember him. Remember his hat. Yes, the hat.

What's that? Round, hard, deadly. Grenade. *Get out. Protect yourself.* Tommy. *Forget Tommy.* Tommy's hit! *Forget Tommy.* No. No! Throws self on Tommy. The grenade goes off, tearing into him. Blackness.

I must rest.

Drift in that blackness for a time. How much time left? How much?

Back again, to the squad leader. Save myself until Ron needs me. Let events go free. Running. Running.

Hard to breathe. Hard to breathe. Safety in the mortar crater. Tommy in behind. *Self!*

Tommy's hit.

Self. Grenade. *Get out. Self.*

Jump upward and out. The explosion and the pain as the fragments tear into the legs. Grayness. *Grayness,* and I rejoice.

His mind numb, I can use his eyes. Turn his head to see his mangled legs. I feel the pain that he has escaped from. He will not be whole, but he will live. *He will live.*

I see other Marines coming. I see the medic. My legs hurt, and I flee from Ron's body and from the stream. I cross to the familiar flow that is my own, and I surface in a cascade of bubbles.

I'm back in Jenning's office, waiting for him to approve my wrap-up. Hell, I know we're a cut-throat organization. Jenning there, he's just enough of a bastard to make it all work.

And really, would ten thousand have been too much to charge for getting the old man's son back? How much would you pay under similar circumstances?

You read about the time machines; and everyone thinks about being able to save a Kennedy or getting to know, really know, a Lincoln. In reality, the common Joe, the common Ron, is just as worthwhile. And Jenning and his flux points wouldn't let you save a Kennedy or know a Lincoln.

Oh, would you look at the scowl forming on Jenning's face. Another one of his "Don't let's overdo it, Webster. I mean effort, yes, but this overachieving . . ." lectures.

I don't know. Can you blame Jenning? The minute I influenced the boy off the grenade, we not only lost the money, because the

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old man never gave it to us, but now I've got to convince Jenning that there was an old man in the first place.

Only time the company takes any money in is when we fail. And then it's only the retainer.

I figured as much. Jenning's making me read my report again.

How should I know who I'm talking about? I never met any old man.

Damn, it sure gets confusing around here at times.

ANSWER TO DRACULA MAKES A MARTINI (from page 42)

If you tried to crack this puzzle by algebra, using exact quantities, you probably got into a hopeless muddle. There is, however, a ridiculously simple proof that the amount of blood in the vodka must exactly equal the amount of vodka in the blood.

We are told that at the finish there was, as before, one quart of liquid in the large bottle, one pint in the small bottle. Consider the large bottle. It is missing an x amount of vodka. Since it remains a quart, this missing amount must have been replaced by an x amount of blood! Of course the same reasoning applies to the small bottle. If it is missing an x amount of blood, and remains a pint, the missing blood must be replaced by an x amount of vodka. In fact, it doesn't matter in the least how many times varying amounts of liquid are transferred back and forth so long as at the finish there is a quart in one bottle and a pint in the other. Even the bottle sizes are irrelevant. The vodka in the blood must equal the blood in the vodka!

Can you invent a simple card trick based on the same curious principle? See page 98 for such a trick.

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ON THE FUNDAMENTAL MYSTERY OF PHYSICS

by Milton A. Rothman

Dr. Rothman, after inventing the science fiction convention, has been writing SF and doing science for many years. His son, Tony Rothman, also does both. Here, a promised discussion of Dr. Rothman's recent work.

1. *An Enigma Lurks Below.*

Deep within the fundamentals of physics lies a mystery—a mystery so profound that it has defied solution since its presence was first recognized over fifty years ago. The mystery has to do with the basic nature of the fundamental particles that make up matter and energy—the electrons, the protons, the mesons, the quarks—and the particle that is the subject of interest in this article: the photon.

During the past half-century physicists have come to think of such particles as consisting of "wave packets," meaning that they sometimes behave like waves and sometimes like hard little particles. This image helps us visualize what kind of beasties these entities are. However, it is most important to realize that the concept of "wave packet" is strictly a *mental model.* Whenever we lose sight of that fact, then we get into all sorts of trouble, and these troubles are both the cause and the result of the mystery.

The science that describes how matter behaves according to this wave packet description is called *quantum mechanics,* invented by Erwin Schroedinger and Werner Heisenberg independently in 1925. Quantum mechanics is the most successful theory in the history of science. By its mathematical equations we can describe the structure of atoms and molecules, as well as the collisions between atoms, nuclei, and elementary particles. This theory has been so well verified by experiment that there is no doubting its validity. It is *the* way of describing matter at the nuclear, atomic, and molecular level.

Because of this success it is easy to fall into the habit of thinking that quantum mechanics explains everything there is to explain. And so, for over twenty years I went along blithely believ-

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ing that I really understood the meaning of this theory. Suddenly, a few years ago, while thinking about a simple experiment in optics, I was struck by an enormous revelation. I realized that if I believed what quantum theory predicted about the results of this experiment, then these results simply could not be understood in terms of any kind of concept that I was familiar with. While the textbooks on quantum theory emphasize that we should not try to understand the structure of elementary particles in terms of classical concepts, this new experiment I was considering gave such utterly *paradoxical* results that I could no longer swallow the conventional interpretations given by the textbooks for such phenomena. I suffered, literally, a loss of faith.

At the time the idea for the experiment entered my mind, I had never heard of its actually being done by anyone. So far it was just a thought experiment, and for a breathless moment I wondered if I had conceived an original idea. Nevertheless, prudence required a search of the literature, and after a few hours of digging through *Physics Abstracts* I found that this experiment had indeed been performed during the 1950's by a group in Budapest, Hungary. The leader of this group was a man named L. Janossy, a well-known figure in cosmic-ray research. Their paper, published in a 1957 *Acta Physica Hungarica* (fortunately in English), described precisely the experiment I had visualized.

The strange part of this affair is that in the 20 years since the publication of the Hungarian paper there has been, to my knowledge, no mention of this experiment in any American journal or textbook, despite what I consider to be its fundamental importance. This may be due to two reasons. First, the Janossy paper was published in a Hungarian journal that not many people over here read. Second, the average textbook writer does not like to bring up topics that are not fully understood. This might confuse the reader. (As well as the writer.)

It's one thing to read about an experiment. It's another thing to do it and see the results with your own eyes. The experiment I had been thinking about was so incomprehensible that I simply had to do it for myself, even though it had already been done and published. Furthermore, it was the kind of thing that could be set up in a small college laboratory, using equipment on hand, for the purpose of edifying and mystifying the students.

So I did the experiment. I got the expected results. When it was all over I understood no more than I had understood originally. *But now I knew what it was that I did not understand.* That was a

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step forward.

2. *What is Light?*

The mystery of this experiment goes back to the 17th century, when scientists first began making serious conjectures as to the nature of light. At that time, Christian Huygens was the leading champion of the notion that light is carried through space by some kind of wave motion. Isaac Newton, on the other hand, believed light to consist of tiny particles, or corpuscles, traveling with great speed from the source to the receiver.

Since there was no evidence of any kind to verify either of these hypotheses, the noise from the argumentation was doubly loud. It was not until 1803 that physical evidence tilted the weight of the argument in favor of the wave theory. In that year the English physicist and physician Thomas Young sent a beam of light through a pair of very narrow parallel slits. Projected on a screen beyond the slits, the image of the light appeared in the form of alternating bright and dark bands.

The simplest way to explain such a result is by a wave model of light. Each slit acts like an individual source of waves. Then at some points on the screen the wave crests from one slit come together with the crests from the other slit, producing constructive interference. This results in a bright streak, or fringe. At points in between, the crests from one slit meet the troughs from the other slit, and the result is cancellation of the two waves—a dark fringe. The alternating bright and dark fringes are seen to be the result of interference between the waves spreading out from the two slits.

The Young two-slit interference experiment gave what most people considered conclusive proof that light must be a wave phenomenon. And, in fact, with this experiment it became a simple matter to measure the wavelengths of these waves. If you can measure a wavelength, there surely must be a wave.

By the end of the 19th century these light waves had become identified as electromagnetic waves—the same as radio waves, but with shorter wavelengths.

However—and this is where the strangeness starts coming in—just as people started believing that light was really a wave phenomenon, evidence from another quarter began to show that Newton was right all along—that light consisted of corpuscles. The most obvious piece of evidence was the photoelectric effect—the thing that operates every photocell, TV camera, photographic

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film, etc. The photoelectric effect (discovered in 1888) is what happens when a beam of light hits a piece of matter and knocks electrons out of that matter. The thing that baffled the early investigators was the fact that the shorter the wavelength of the light, the more energy the ejected electrons had. There was no way for classical electromagnetic theory to explain this observation.

The situation was clear: the existing theory could not explain the experiments; therefore the theory had to be changed. It was as though the turning of the century was a trigger. In 1900 the German physicist Max Planck introduced a new concept—the idea that electromagnetic energy was emitted by matter in little bundles, or *quanta,* rather than in continuous wave trains. Planck devised this notion to explain a mystery about the emission of light from hot solids. In 1905 Albert Einstein perceived that the same idea could explain the curious results of the photoelectric effect, which, you notice, deals with the *absorption* of light by matter. Emission and absorption—the beginning and end of a light quantum.

Einstein's explanation was simplicity itself, and for this he was awarded the Nobel Prize, for it required a totally new way of perceiving the nature of light. First he assumed (together with Planck) that the energy of the light wave appears in discrete bunches (or quanta), and that the energy of each quantum is proportional to the frequency of the wave. Second, he assumed that when a quantum of light is absorbed by an atom, the quantum disappears and all of its energy is given to an electron, which is then knocked out of the atom. Thus, by measuring the energy of the electron, you are measuring the energy of the light quantum.

Notice that this description uses the concept of wave frequency, but also speaks of the energy being collected in one small lump. For the first time a single object is described as having the properties of waves and particles simultaneously.

In 1923, Arthur Holly Compton discovered that a high-energy x-ray quantum could actually collide with an electron and recoil from it—just like one billiard ball bouncing from another. This was really distinct evidence that a quantum of light behaved just like any other particle, the major difference being that it had no "rest-mass" and could only travel at the speed of light. Compton gave the name "photon" to this particle of light, and this is the name that we use at the present time.

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3. *Waves and Particles.*

Now the idea of a photon (or an electron or a proton) being both a particle and a wave was very unsettling when first introduced, and is still hard to swallow, because it makes use of two opposite concepts at one time. A particle is located at one point in space, while a wave is spread out in space. One way of getting around the dilemma is to think of the photon as being a *wave packet*—something that travels through space in the form of a localized bunch of waves, spread out to a certain extent. Yet, when it interacts with matter so that the photon is *detected*, then all the energy appears at a single point. (Fig. 1) That makes it seem like a particle.

Such a picture makes a nice model—and you can get along with it very well for most purposes. But there are certain experiments that make it very hard to comprehend. The first of these experiments was done in 1908 by an enterprising graduate student at Cambridge University named G.I. Taylor. The experiment began when Taylor wondered what would happen if you tried to produce an interference pattern with light so feeble that only one photon at a time went through the apparatus. Would you still get light and dark fringes?

Instead of repeating Young's double-slit experiment, Taylor simply photographed the shadow of a needle, "the source of light being a narrow slit placed in front of a gas flame. The intensity of the light was reduced by means of smoked glass screens." It had

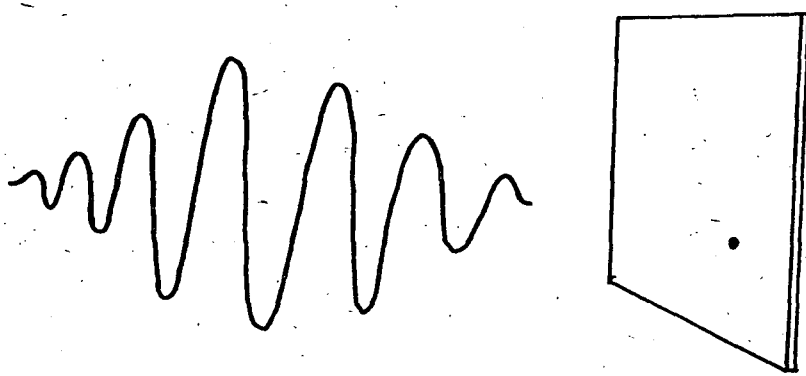

FIG. 1. The wave packet of a photon is spread out over some region of space. But when it knocks an electron out of an atom so that it is detected, all its energy appears at one point.

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long been known that the shadow of a sharp edge would exhibit interference fringes when projected onto a screen or photographic plate. In Taylor's crucial experiment; he reduced the intensity of the light to such an extent that it required an exposure of *three months* to obtain a blackening of the photographic plate. It can be estimated that under these conditions about one million photons per second were hitting each square centimeter of the photographic plate.

While this sounds like a lot, it represents only one photon at a time, since each photon takes about a hundredth of a microsecond to land on the plate. In Taylor's experiment, the average time *between* photons was about one microsecond. Thus, there was little chance of two photons overlapping.

Now visualize what happens in this experiment. A photon dashes past the edge of the needle and is deflected from its path. It lands somewhere on the photographic film and blackens a grain of silver. Another photon comes along later and does the same thing, but lands somewhere else. After several billion photons have gone by, the film is developed, and *voila*: you behold an interference pattern with light and dark stripes. Clearly the photons have chosen to concentrate in certain areas, while avoiding others.

To understand how this happens, we will find it easier to look at the Young two-slit experiment rather than Taylor's experiment, since interference from a single edge is somewhat complicated to describe. It's much easier to start with a pair of slits, which behave like a simple pair of light sources. If photons were nothing but tiny particles, then sending a beam of them through a pair of narrow slits would result in the pattern shown in Fig. 2-a. However, what we actually see is the pattern shown in Fig. 2-b. This pattern is exactly what we expect from the constructive and-destructive interference of crests and troughs belonging to the wave trains originating at the two slits (Fig. 2-c).

Two important facts stand out. First, the pattern is completely independent of the intensity of the light. You get the same picture whether you use bright light containing billions of photons per second, or weak light containing one photon per second. Second, each photon only blackens one grain of film. You don't get a whole interference pattern from a single photon. It is the cumulative effect of billions of photons that produces an interference pattern.

A very strange thing is this: when a single photon goes through

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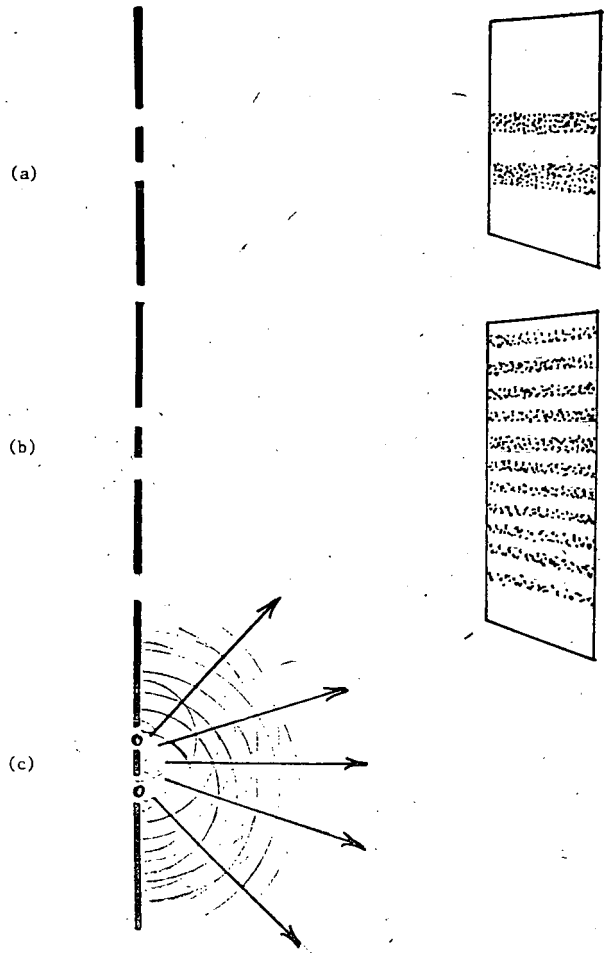

FIG. 2. Light coming from the left passes through a pair of slits in a screen. If the light consisted of tiny particles, you would see a pair of bright stripes on the screen beyond. (a) (Dark stripes on a photographic negative.) Fig. (b) shows the actual image seen: a series of alternating light and dark fringes. Fig. (c) shows how such fringes are explained by picturing a set of circular waves starting from each slit. Where the two sets of waves intersect is found the maximum light intensity.

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the two slits, you can't tell where it goes while it is in transit. You don't know which slit it went through, and you can't predict ahead of time where on the film it is going to darken a silver grain. You can only tell where it landed, *after it has landed.*

The only thing you can infer from the interference pattern is this: the experiment behaves as though there is a wave packet flowing through *both* slits, dividing into two parts, and coming together on the other side. Clearly, the wave packet must spread out over the whole width of the fringe pattern—which might be a matter of several centimeters. Yet, when the packet hits the film, *all* of the photon's energy is instantly sucked up into one single electron, which is knocked out of its normal position in a silver halide molecule.

In other words, *while the photon is traveling through space its wave packet may be spread out over a large area, but when it is detected it appears at a single point in space.*

This effect is called "reduction of the wave packet." It is within this reduction process that the greatest mysteries of modern physics lie. Two of these mysteries are immediately obvious. First, if you think of the photon's energy as being spread out through the packet, then it is very mysterious that it can so abruptly be concentrated into one place. Second, it is mysterious that the position where the photon is detected appears to be determined entirely by chance. There seems to be no particular reason why one grain of silver on the film should be darkened rather than another. This fact results in a breakdown of the classical concept of "determinism."

Questions such as these worried a great many people during the 1920's when quantum theory was first being set up. It was not clear what one was to make of this wave packet. Just what kind of wave was it? What was the meaning of the random darkening of the film grains? The attempt to answer these questions resulted in the modern science of Quantum Mechanics.

4. *Quantum Theory.*

Modern quantum theory began in 1923 with the hypothesis of Louis de Broglie that material particles were similar to quanta of light in that they could be thought of as wave packets. Instead of being a hard, featureless ball, an electron was found to have a wavelength associated with it, and could make interference patterns when sent through narrow openings. Erwin Schroedinger, in 1925, showed how this hypothesis allows you to calculate all sorts

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of wonderful things, such as the size and shape of a hydrogen atom, as well as the wavelengths of the light given off by the hydrogen atoms when the gas is heated. These wavelength calculations were most important, for a wavelength is something that can be measured experimentally and compared with the theoretical predictions. The excellent agreement between theory and experiment is what made physicists believe that this strange theory had some real validity to it.

The entire theory was based on the idea that the electron or other particle consists of a wave packet. The mathematical symbol for the *wave function* was chosen to be *psi* (Ψ). This is the thing that *waves*. It is the mathematical quantity that obeys the wave equation. Yet, what does Ψ represent physically? That was not clear at first.

It was Max Born who came to the rescue. In 1926 he made the proposal that everything about quantum theory could be understood if you made the following interpretation of Ψ: Take the quantity Ψ, square it, and multiply by an element of volume in space. (The element of volume is a small portion of the volume within the wave packet.) The product of psi-squared multiplied by the volume element gives you the probability of finding the particle within that particular volume you have chosen. (To be precise, we use the absolute value squared—$|\Psi|^2$—since Ψ may be a complex number.)

For example, if Ψ is represented by the wave packet shown in Fig. 3-a, then Fig. 3-b shows $|\Psi|^2$, which we call the probability density of the packet. The area under the curve between A and B represents the probability of finding the particle within the region of space between A and B. (The total area under the curve is defined to be unity, since the particle is certainly to be found somewhere along the x-axis.)

With this interpretation, we *do not* claim the wave packet represents the particle smeared out all through the space covered by the packet. We *do not* think of the particle as a blob or a cloud, even though we may sometimes call it that in elementary writing to avoid going into detailed explanations such as this one.

No. What we mean is that the wave function Ψ is a probability wave. And what that means is that we don't know exactly where the particle is within the wave packet. All we know is that if we put detectors at various places within the packet, the shape of the curve gives us the relative *probability* of the particle being *detected* at one place or another within that region of space. The de-

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tector itself may be nothing more complicated than a silver grain on a film.

The important thing is that we have absolutely no way of predicting the fate of a single particle. The curve only tells us that if we have a billion particles hitting the film, some will go to one place, some will go to another place, and at the end we will have a darkening of the film whose form is predicted by the shape of the probability curve.

The fact that we cannot predict where a particular particle will land means that the wave function does not give us complete information about the motion of individual particles. The only thing we can calculate from the equations are averages and expectations. This feature of quantum mechanics comes under the heading of the Heisenberg Uncertainty Principle.

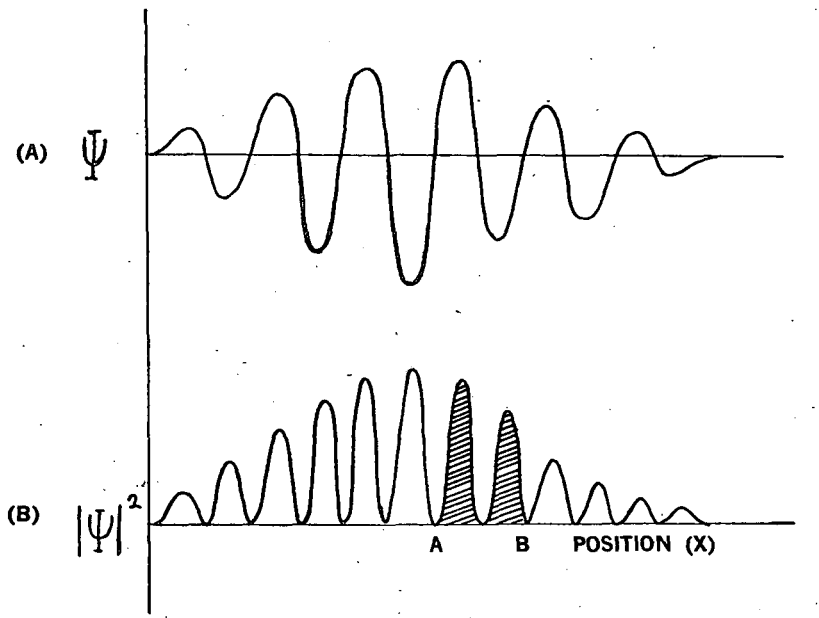

FIG. 3. A hypothetical wave packet. (a) shows the form of the Ψ-function, while (b) shows the square of the Ψ-function. The area under any portion of this curve represents the probability of finding the particle within that region of space.

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A somewhat analagous situation is this: imagine a thousand students entering college and graduating four years later. You know nothing about any individual student, and so you are completely unable to predict what kind of grade point average a particular student will have when he/she graduates. However, you can make a pretty good prediction of the class distribution (based on previous statistics). So many students will fall between 3.5 and 4.0, so many will fall between 3.0 and 3.5, and so on. That is the way quantum mechanical calculations turn out.

In the early days of quantum theory, some people really considered the Ψ function to represent some kind of "probability wave," as though probability were actually something physical, something that could travel through space as a wave and could be applied to a single particle. This is the kind of thinking you use when you roll a die and say, "The probability of rolling a 3 is 1/6." Actually, you don't know anything at all about a single throw. You only know that if you make a lot of throws, about one-sixth of them are going to be 3's.

In the same way, it gradually became apparent to the theorists that the Ψ -function really says nothing at all about the behavior of a single electron or photon. It merely tells you what would happen if you had a million particles traveling in the same beam. A certain number would go in one direction, a certain number would end up in another place, and so on.

This was a very unsatisfying situation, philosophically speaking, to many people. Einstein was one, in particular, who disliked the thought that physics was completely unable to predict the path of a single electron. In this respect, Einstein's position has often been misunderstood. Einstein did not disagree with quantum theory; as one who contributed to the early development of quantum concepts, he completely understood what the theory stated. Indeed, he was one of the leading exponents of the point of view that the Ψ -function only gives information about large numbers of particles (a statistical ensemble) and tells you nothing about the behavior of an individual particle. He insisted that quantum theory was nothing more than a statistical theory.

What disturbed Einstein was the claim made by the quantum theorists such as Bohr and Heisenberg that it was *impossible* to make a more exact theory, a theory that would explain in greater detail how the motion of individual particles was determined. In fact, it was a basic part of Heisenberg's Principle of Indeterminacy that it is completely impossible to tell exactly where a parti-

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cle is going to travel once it has been launched. You can only locate it after it has been detected and stopped.

Einstein, on the other hand, believed that quantum theory was incomplete, that it did not give a total picture of what was happening in that microscopic world within the wave packet.

5. *The Splitting of Wave Packets.*

Einstein's doubts in these matters were made public in a famous series of debates that he conducted with Niels Bohr at various scientific meetings. Einstein's method was to pose a question based on a thought-experiment, and Bohr would describe what would happen in that hypothetical situation according to the predictions of quantum theory. By this process, many of the mysteries of quantum theory were clarified at the time this new and strange subject was in its infancy.

A crucial question posed by Einstein at the Solvay Conference of 1927 has given rise to an entire literature of controversy, and is the question behind the experiment that is the subject of this article. Einstein's question was this: *what happens to a single photon when it encounters a half-silvered mirror?* (A half-silvered mirror, remember, is a mirror with a very light reflecting coating, made so that some of the light is transmitted and some of the light is reflected. It is a common optical device used to split a light beam into two parts. If this beam-splitter is properly made, the transmitted part is equal to the reflected part in intensity.)

This question of Einstein's is a most diabolical one, and is clear evidence of the incomparable depth of his mind.

The answer to Einstein's question, according to quantum physics, is straightforward and simple: the wave packet divides into a transmitted wave and a reflected wave. Each of these parts of the packet goes off on its own journey after leaving the mirror (Fig. 4).

It would appear from the diagram that two wave packets now exist where formerly there was one. However, do not think this for a moment. Remember that the energy of a photon depends on the frequency of the wave. If we think of the reflected and transmitted waves as being two separate photons, each part must have the same amount of energy as the original photon, since it has the same frequency. This means we end up with twice as much energy as we started out with. This cannot be so.

To understand what happens we must recall the statistical interpretation of the wave function. When the wave packet splits at

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the half-silvered mirror, the amplitude of each part is reduced. So now we say the probability of finding the photon in the reflected part is 1/2 and the probability of finding the photon in the transmitted part is 1/2. (For simplicity we are assuming equal reflection and transmission; this is not a necessity.) *The two half-packets still make one single packet,* and so the probability of finding the photon somewhere within that packet is still unity.

But now this interpretation has an extremely important consequence: detectors placed in the paths of the two beams will detect a given photon *either* in the transmitted beam *or* in the reflected beam. A given photon has to be detected in either one or the other beam, but not in both at once. The net result is that each detector will count half of the photons.

That's all well and good, but now another question comes to mind. Consider the split wave packet, with its two half-packets

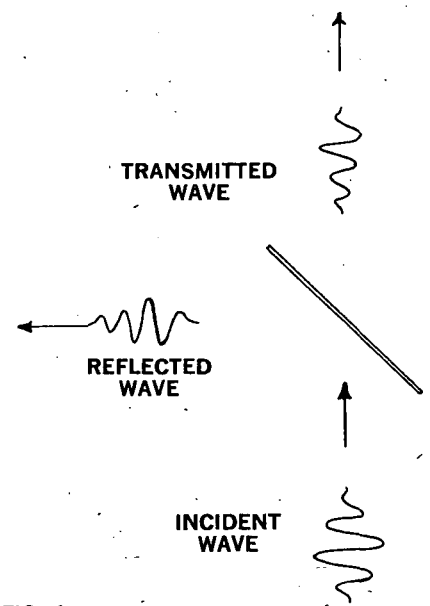

FIG. 4

FIG. 4. When a wave packet hits a half-silvered mirror, part of it is transmitted through the mirror and part of it is reflected from the face of the mirror.

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going in different directions. Each of these half-packets is presumably identical, and each one encounters an identical detector. Why is it that only one detector triggers? If one detector triggers, what prevents the other one from triggering at the same time? After all, it is being hit by an identical half-packet.

The impact of the question is magnified if we imagine the apparatus to be very big so that the two detectors are, let us say, a light-year apart. In spite of this great separation the theory tells us that only one detector will trigger, even though both encounter identical half-packets. If one detector triggers, how does the distant detector know that it must not trigger at the same time?

An easy answer would be to say: well, the above explanation is all wrong, and all that happens is that half the time the photon is reflected and half the time it is transmitted through the mirror in a random sort of manner. This would explain very simply why only one detector or the other triggers.

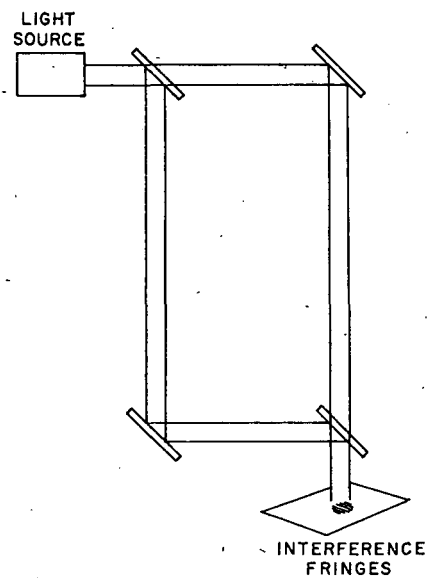

FIG. 5. A Mach-Zehnder interferometer consists of two half-silvered mirrors and two totally reflecting mirrors. The split beam goes around the two legs, and when it is brought back together it shows interference fringes.

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But then still another question raises its ugly head. Suppose we add three more mirrors to the apparatus, in such a way that the two light beams are brought back together at a second half-silvered mirror (Fig. 5). An arrangement such as this is called an interferometer, because when the mirrors are adjusted properly, an array of light and dark fringes are seen at the output of the device. This occurs because different rays of the two beams travel slightly different distances to get from the first half-silvered mirror to the second. If the difference is such that two wave crests come together, then a bright spot is formed; if a crest meets a trough, then there is a dark region.

Interferometers have been known for a long time and have many practical uses: measuring lengths very precisely, measuring the index of refraction of gases; testing the theory of relativity, etc. However, at a certain instant of time in 1976, I had never heard of an interferometer being used with light of such low intensity that *only one photon at a time went through it.* This would be analagous to the Taylor experiment described previously, and by analogy one would expect the same result: interference fringes should be produced as a result of each individual photon interfering with itself.

But what does this mean? It means that a given wave packet really must split and go around *both* legs of the interferometer simultaneously; this is required in order to get interference.

But if this is what happens, then you *cannot* say, simply, that the photon goes either one way or the other. The wave packet goes *both ways* at the same time. But if the wave packet goes both ways at once, why do we never *detect* the photon in both legs of the interferometer simultaneously?

We have here all the elements of a paradox.

6. *The Experiment.*

It was at this point that I decided to do the experiment, because I had to see for myself what actually happens. The experiment could not have been performed in 1927 when Einstein posed the original question, because the necessary photon detectors had not yet been developed. Now, in 1978, anybody with a few thousand dollars worth of equipment can do it. (Actually, I only spent about $1500 for the optics. The photomultipliers and associated electronics were already at hand in the Trenton State College radiation lab, and with the kind assistance of Dr. Gerald Nichols, our radiation person, the apparatus was quickly assembled.)

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I will describe the experiment the way I did it. The Hungarian experiment reported in 1957 was more elaborate and went into certain details of quantum statistics that I avoided. But the parts of the procedure and the results pertaining to the fundamental question were the same.

The experiment has two parts. The first part is shown in Fig. 6. It consists simply of a light source, a light filter, a beam splitter, and a pair of photomultiplier tubes for detecting photons. The light source is a simple mercury-vapor bulb with an interference filter that allows through just one line of the mercury spectrum, the 4358-Angstrom blue line. The source is thus fairly monochromatic. A laser light source would have made the interferometer much easier to adjust, but since the photons come out of a laser in correlated bunches, this kind of source is just what we do not want. A mercury source emits photons at random, which is what we do want.

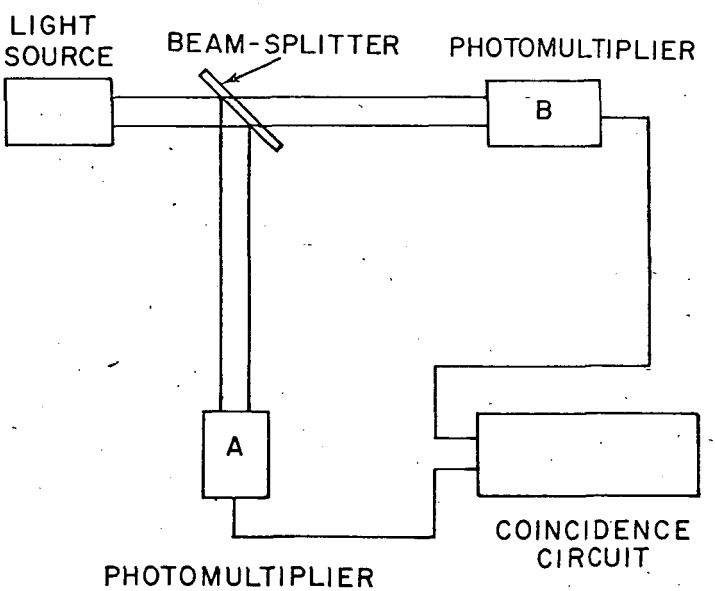

FIG. 6. Photomultiplier tubes are used to detect photons of visible light in the split beam. The coincidence circuit gives a signal whenever the two detectors trigger simultaneously.

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The photon detectors were ordinary RCA photomultipliers, with an efficiency of about 20%, and a maximum sensitivity in the blue region of the spectrum. (The 20% efficiency means that out of every five photons hitting the cathode, one electrical pulse is produced, on the average.)

At first I had worried about the necessity for cooling the photomultipliers in liquid nitrogen (or at least in dry ice) to reduce the electrical noise, for this is a common procedure in experiments involving the counting of single photons. However, I found that under the conditions of this experiment there was no need to worry about cooling, because the number of photons from the light source was much greater than the number of noise pulses from the phototube. Therefore I treated the noise pulses just the same way I would treat background counts in a Geiger counter: simply count them and subtract them from the total counts to get the net counts produced by real photons.

This was my first and most pleasant surprise—how easy it now is to detect and count single photons of visible light—especially with modern, fast electronics. (My previous experience with photomultipliers had been limited to counting gamma rays, which is another story.)

In order to reduce the intensity of the light to the point where only one photon at a time went through the apparatus, I needed neutral filters. At this point I had spent all the money I wanted to spend. My eye fell upon some black plastic garbage bags. In a trice I had cut one up with a pair of scissors, and found that two, three, or four thicknesses of this black (actually dark green) plastic gave just the range of counting rates that I wanted. (Somehow that tickled me more than anything. A thousand bucks for precision mirrors with micrometer mounts, a hundred dollars for a line filter, and two bits for a garbage bag.)

It did not take long to determine that the beam splitter was working as advertised. Roughly 30% of the photons were counted at A, and another 30% at B. (The beam-splitter itself absorbed the other 40%.) Next, the output of each detector was connected to a coincidence circuit. This is a piece of electronics that gives an output pulse *if* and *only if* input pulses are fed simultaneously to its two input terminals. (Or at least within one microsecond of each other; this is the resolving time of the circuit.)

Since the photon pulses are not evenly spaced, but occur randomly, there is a certain probability that a photon will enter counter A and another photon will enter counter B less than a

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microsecond later, simply because of chance. The number of such random coincidences can be calculated; it is a standard problem in radiation measurement.

The results of the measurements showed that the number of coincidences counted was just what you would expect from chance, and no more. What this means is that each photon is counted *either* at detector A *or* at detector B. The two detectors never trigger together unless two independent photons happen to arrive together by chance.

Well, this is just what we expected, so we are not surprised. A single photon does *not* split at the half-silvered mirror; it goes either to one detector or the other. It can't be in two places at the same time.

However, we now go on to the second part of the experiment. We take away the photomultipliers and install three more mirrors so that we have the interferometer arrangement discussed previously and shown in Fig. 5. The light beam is split at the first half-silvered mirror, each of the resulting beams is reflected from a totally reflecting mirror, and then the two beams come together at another half-silvered mirror. If all the mirrors are adjusted properly (and micrometer-controlled mirror mounts are really necessary), then interference fringes will be seen in the recombined beam. The fringes can be seen either by projection on a photographic film, or by looking into the beam with a telescope.

An interferometer of this type (with 4 mirrors) is known as a Mach-Zehnder interferometer. It is somewhat more difficult to adjust than the more common Michelson interferometer (with only 3 mirrors), but it has the advantage of making the two light paths symmetrical and equal in length. Such an interferometer is such a sensitive device that one could see shifting of the fringes just from touching the tabletop with a fingertip, or by breathing into the space between two of the mirrors. (Not being able to afford a $3000 optical table, we used an ordinary laboratory table of heavy wood with a ¼-inch steel plate on top to mount the optics. The table legs were set in buckets of sand to reduce building vibrations.)

I photographed the interference fringes with a Polaroid camera, adding a pair of additional lenses to make a telephoto effect and enlarge the image. After focussing the fringes on a ground glass screen, I replaced the screen with a pack of 3000-speed black and white Polaroid film, and began making exposures. The adjusting and focussing operation was exceedingly delicate, but with pa-

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tience was finally accomplished.

If only the line filter was placed between the light source and the interferometer, a 1/10-second exposure sufficed to take a picture of fringes. However, this was much too many photons to be useful. With one of my garbage-bag plastic filters added, I found a 5-second exposure was needed. This was still too much light. With two thicknesses of garbage-bag filters, a full one-hour exposure was needed to photograph fringes. (This required sitting in the dark for an hour, trying my patience to the limit.) The amount of light getting through the filters was barely visible to the naked eye, yet it corresponded to about one million photons per second going through the interferometer, as counted by the photomultipliers. However, since a photon is expected to take only about 1/100-th of a microsecond to be photographed, this million photons per second is actually quite widely spaced.

The fact that the coincidence rate of 1 million photons per second was still very little above what you would expect from chance proves this vital point: that photons were not overlapping to any great extent in the interferometer.

The results of this experiment are shown in Fig. 7, where we see the actual fringes photographed in both the 5-second and 1-hour exposures. You can see that they are essentially identical, showing the same fringe pattern. Thus we prove that interference fringes can be produced one photon at a time.

Each wave packet interferes with itself.

7. *Stating the Problem.*

What does it mean when we say that each wave packet interferes with itself? What we mean is this: in order to get fringes we must divide the wave into two parts at the first mirror, send each part around two different paths, and bring them together at the last mirror, where the two waves either add together or subtract from each other. This addition or subtraction happens individually for each wave packet.

Thus, in order to get interference fringes, the waves from each packet must go around *both legs* of the interferometer simultaneously. This can be demonstrated simply by holding a card in one leg so that the beam going through that leg is interrupted. The output of the interferometer then becomes simply a featureless spot of light. Both beams are needed to make fringes. Furthermore, if you change the angle of *any one* of the four mirrors, you shift the position of the fringes. This demonstrates that the

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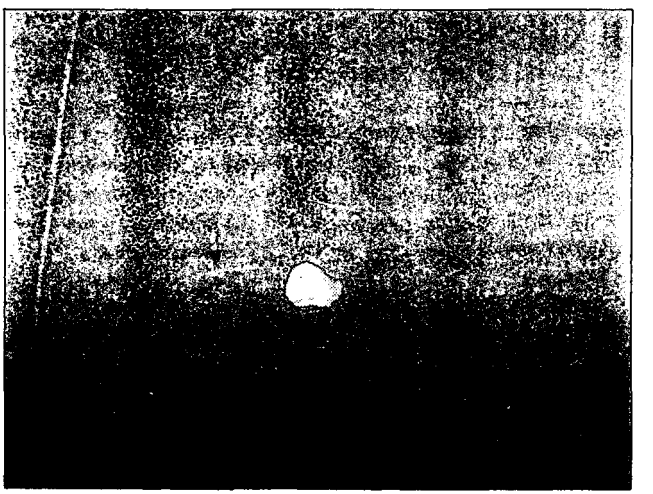
ONE FILTER
FIVE-SECOND EXPOSURE

FIG. 7. Photographs of interference fringes obtained with the interferometer. The one-hour exposure had one million photons per second going through the interferometer, which is slow enough so that this picture was taken one photon at a time.



TWO FILTERS
ONE-HOUR EXPOSURE

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entire interferometer takes part in the production of the fringes.

Therefore, we cannot explain the results of the counting experiment (Fig. 6) by saying that the half-silvered mirror merely sends a photon to either one detector or the other. The half-silvered mirror divides the wave amplitude so that half of it goes to one detector and half of it goes to the other detector. There is nothing in either theory or experiment to indicate that the two halves of the wave packet differ from each other.

And yet—a photon is detected in only one detector at a time. Two identical half-packets impinge upon detectors A and B, and we find that either A triggers or B triggers. If A triggers, B does not trigger, and vice versa.

We have now penetrated to the core of the mystery. *Why is it that two detectors can be hit with the same stimulus, and yet only one of the two will respond?*

Do not make the naive error of replying that each half of the wave packet carries with it a 1/2 probability of triggering a detector, and that is why each detector only triggers half of the time. This argument implies that the two probabilities of detection are independent of each other. But if that were the case you would expect to detect photons simultaneously in both detectors 25% of the time. It is similar to the coin-flipping problem: if you flip two coins, the probability of getting a head on each throw is 1/2. Since the two coins are completely independent of each other, the probability of getting two heads together is ½ x ½ = ¼.

But the experiment does not show this at all. It shows that we have an either-or situation; the probability of detection in A is ½, the probability of detection in B is ½, and the probability of detection in either A or B is ½ + ½ = 1. This implies that the two detectors are not independent. If A triggers, B does not trigger.

8. *Conjectures and Refutations.*

Actually, there is almost nothing new about the problems raised by this interferometer experiment. The situation is very analagous to that of the two-slit diffraction experiment. In that experiment we could just as well have asked the question: why does one grain of silver darken rather than another when a wave packet hits the photographic film?

However, there is one important difference between the two experiments. In the two-slit experiment the wave packet never spreads very far, so you can hide your ignorance by saying that you can't tell what is going on inside a single wave packet. In the

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experiment with the half-silvered mirror we can imagine the detectors to be so far apart that the wave packet is divided into two distinct and separate halves. It then becomes difficult to understand the results.

Historically, many problems similar to this one have been recognized in quantum theory. And historically, three ways of handling these problems have developed.

One way is to come out flatly and say that it is impossible to observe what happens inside a single wave packet, it makes no sense to talk about unobservable objects, and therefore these are meaningless questions that cannot be answered.

A second way is to say that there must be something going on inside a wavepacket that could be observed if we knew how to look, and that this inner life of the wave packet could explain the paradoxes involved in the wave-particle situation.

A third approach says that an entirely new kind of theory is required, one that abandons the classical concepts of wave and particle entirely and replaces them by new and more abstract concepts.

I can hear members of the audience screaming, "Get rid of waves and particles? What else is there?"

Well, at the moment I don't know. But one thing we always must keep in mind when we think deeply about these matters is to recognize that our bodies, our sensory organs, our brains are all made of atoms like everything else, and that the only way we have to gain information about the world around us is through signals sent to our brains through our various sense organs. How this happens is one of the great mysteries of nature, but the fact remains that our concepts about the things around us are essentially inventions. The only information entering my brain when I look at an apple is a series of coded pulses surging through my optic nerve; the image of *apple* is invented.

Similarly, the concept of *particle* results when a single grain is darkened in a film or a single pulse comes out of a detector. Something darkened the grain, so we *call* it a particle. On the other hand, when millions of grains are darkened and I see bright and dark fringes on the film, then I *infer* (invent) a wave, because a wave kind of thing is all I know that produces such patterns.

All of this has been known since Plato compared our minds to the inside of a cave, with shadows dancing on the walls from which we infer the nature of the outside world. There are various ways of handling this idea, each way leading to a different kind of

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theory about nature.

The "naive realist" believes that the images in his mind correspond to real physical entities existing in nature. Atoms, electrons, photons, are real things in this way of thinking, and it is the function of science to get us as close as we can to visualizing the concrete nature of these things.

An alternative view, held by positivists of various types, is that reality is a very abstract thing, that what we think we know about it is entirely a made-up fiction—that particles, waves, energy, even space and time are simply metaphors or analogies that we construct in order to get some kind of handle on what is going on out there. The prevailing interpretation of quantum mechanics falls into this category.

There is a third way of looking at the world—that of the idealist, who says that *everything* is just a mental construct, that the only reality is the primary sensation in the mind, and everything else is a fiction. But that way lies solipsism and madness.

Now the viewpoint of the naive realist seems simplest and most common-sensical. Indeed, none other than Albert Einstein considered himself to be a naive realist and always tried to make his theories represent some reality of nature. Why is it, then, that the majority of modern theorists fall into the second, more abstract category?

The reason is this: whenever you try to think of the world in terms of material objects such as waves and particles (or even wave packets) you get into logical difficulties. The paradox we have seen resulting from the interferometer experiment is one example of the trouble that arises whenever you try to explain such happenings in terms of waves and/or particles.

Many attempts have been made to answer the question, "What happens to a photon when it encounters a half-silvered mirror?" Whenever these attempts involve concrete, realistic ideas, paradoxes arise. For example, in the 1930's Werner Heisenberg tried answering the question by saying that the transmitted half and the reflected half of the wave packet goes along until one of them triggers a detector (or is otherwise absorbed by a piece of matter). Then the entire wave packet instantaneously collapses. This means that the half-packet way over at the other detector must collapse at the same time. This requires transmission of some kind of signal instantaneously from one half-packet to the other. And faster-than-light transmission of signals isn't considered kosher in physics. But Heisenberg shrugged this off by say-

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ing that it is not possible to transmit any kind of message from detector A to detector B, so this operation does not defy relativity.

Unfortunately, this argument does not hold water if you change the arrangement to that shown in Fig. 8, where detector A is very far away from the half-silvered mirror, while detector B is relatively close. How do you explain the situation where detector A triggers, while detector B remains silent? In this situation the half-packet at B has to know *ahead of time* that A is going to be triggered. The collapsing-wave packet theory requires that the message goes from A to B *backwards* in time. This is the kind of trouble you get into whenever you try to apply naive, classical, "realistic" concepts to quantum mechanics.

All this conjecture is made irrelevant, however, when we realize that the wave packet has no meaning when used to describe a single particle, according to the modern way of looking at things. The wave packet is only supposed to describe the statistical behavior of a large number of particles; it is nothing more than a mathematical device. This way of looking at things puts us into

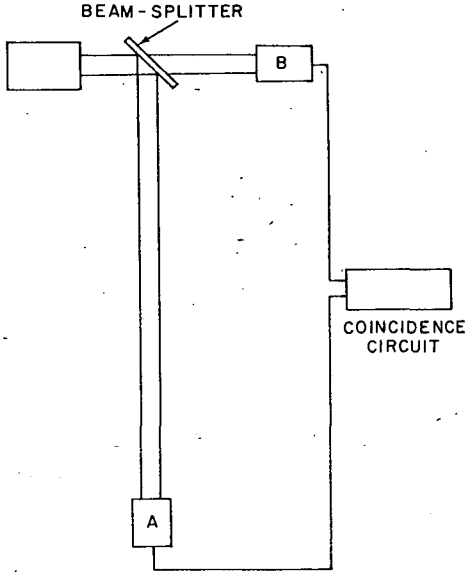

FIG. 8. What happens when one counter is farther from the mirror than the other?

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the second philosophical category, and we simply fall back on the admission that quantum mechanics doesn't tell us anything about the behavior of a single particle.

On the other hand, if we insist on remaining realists, we would like to have *some* way of picturing a single electron or photon. We think there ought to be some lower level of reality beneath the quantum-mechanical wave packet. If the wave packet is telling us statistics, what is it telling us statistics *about*?

So we turn to another kind of model and try it out for size. Suppose we make the following assumptions: A wave packet is a real kind of thing that carries energy from one place to another. The energy itself is located in a very small region of the wave packet. The bulk of the wave packet is non-material and non-energetic, and is called a "guiding wave." While the packet is moving through space you have no idea where the energy is located within the packet. Only when the particle is "detected" does the position of the energy make itself known.

Such a model was actually proposed by Louis de Broglie at a very early stage of the quantum theory game. He discarded this model at some point, but has in recent years come back to it.

The de Broglie model is not generally accepted by the physics community, but let's see where it leads us if we apply it to the interferometer experiment. If a wave packet with a little hard lump of energy buried in it hits a half-silvered mirror, the guiding wave splits into a reflected and a transmitted part, but the energy can only go one way: it can be either reflected or transmitted. The chance occurrences during the scattering of the photon from the mirror make the decision as to which way the energy is going to travel.

This model does a rather good job of describing what happens in the interferometer. The guiding wave goes around both legs of the interferometer, producing the interference fringes, while the energy lump travels either to detector A or detector B in a random sequence. The model has the virtue of not requiring faster-than-light signals to explain why only one detector triggers at a time.

Is there anything wrong with this model? One difficulty is that there is no way of testing its validity. It doesn't predict any observable results that could not be gotten from conventional quantum mechanics. Thus, you don't get any new information, while at the same time you are saddling yourself with unobservable constructs such as guiding wave and energy lump. And physicists

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don't like to deal with unobservables unless they are absolutely forced to.

Another difficulty is the fact that this model introduces us to an unsavory character: a portion of a guiding-wave packet without energy (the part that does not get detected). This is unheard of.

Notice what an interesting thing has just happened. We have invented a model that describes what happens inside the interferometer in a comfortable way. (That is, I am comfortable with it.) Yet it cannot be verified, it deals with unobservables, and it doesn't buy anything that can't be bought with the conventional theory. Its only advantage is that it gives us something to visualize.

This kind of model is an example of a "hidden variable" theory. Hidden variable theories have been played with for over two decades by a group of theoreticians who are unhappy with the fact that quantum mechanics does away with determinism on a microscopic level. The interferometer experiment is a prime example of this breakdown of determinism, for in that experiment it is impossible to predict whether a given photon will trigger detector A or detector B. Furthermore, a series of photons will go to A or to B in a random manner, as though there were nothing but "chance" deciding on its path. (In other words, the same cause can produce two different effects; this could not happen in a truly deterministic universe.) So if you ask, "Why did the photon trigger detector A instead of detector B?" the physicist adhering to the conventional interpretation of quantum mechanics will say, "There's no way to answer that question. It's just part of the Principle of Indeterminacy."

But there is a minority view among a group of physicists who think this kind of reply just sweeps the truth under the rug. They think that there are things going on inside an individual wave packet that you can't see on the outside, but which result in the random behavior of the wave packet as a whole. They have developed a whole class of hidden variable theories.

Hidden variable theories are very attractive (especially to realists) because they promise to return the concept of strict determinism to a science which has lost it. This was just what Einstein meant when he made the famous statment about God not playing dice with the universe. He did not like to see a physics in which it was possible for a photon to hit detector A instead of B for no apparent reason at all. Determinism means that every effect has a cause and the same cause always gives the same effect. But in

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the way quantum mechanics had developed in the early days it was possible for the same cause to have many different effects. Hidden variables at least attempted to say there was some reason on a sub-microscopic level for a particle to choose one destiny over another.

The physicist David Bohm made a strong argument for hidden variables in the late '50's, and in the two decades since then has attracted an active following. There were two difficulties with the theory from the outset. First, it was hard to make the theory predict some experimental result that differed from ordinary quantum mechanics. After much effort and dispute, certain varieties of hidden variable theories were shown to predict measurable results, and so it was possible to go ahead with decisive experiments.

Secondly, and unfortunately, the experiments have not supported the hidden variable idea. To my knowledge, the experimental tests done to date verify conventional quantum mechanics and do not verify hidden variables. So hidden variables, while a lovely idea, doesn't seem to work. At best, there might be a kind of hidden variable in operation that doesn't show any observable differences from conventional quantum mechanics. So it doesn't make any difference if you believe in it or not.

Where are we, then? We are at a point where we may need a very radical change in viewpoint in order to explain the paradoxical behavior of fundamental particles. We may have to stop using the term "wave packets" altogether. We may have to change our notions of space and time.

A physicist named Mario Bunge, who works down among the philosophical foundations of physics, has devised a way of presenting quantum mechanics without mentioning either waves or particles. He does have a Ψ -function and he talks about something called "quantons," and he ends up with something very much like conventional quantum mechanics, but without any kind of physical entities that can be pictured in your head. It is okay for mathematicians and theoretical physicists, but it is emotionally unsatisfying to us mortals who ask silly questions like, "Why does the photon trigger A instead of B?" In an abstract theory questions like that are not allowed.

A different kind of theory is the one called "The Many-Worlds Interpretation of Quantum Mechanics." First published in 1957 by Hugh Everett, and developed further by R. Neill Graham and Bryce S. DeWitt, this is a theory of such utter strangeness and

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mind-boggling weirdness, that every science fiction reader will recognize its origins. The basic theory was contained in Everett's doctoral dissertation at Princeton. In order to get it published in the *Reviews of Modern Physics* and recognized by the profession as a valid conjecture, his advisor John A. Wheeler, a man of solid repute, appended a brief note saying, in effect: look, fellas, this sounds like a wild idea, but there's nothing wrong with it, the mathematical development is sound, and it deserves consideration.

A complete description of the theory would require an entire article by itself, but let me give a very brief rundown. The many-worlds interpretation starts by picturing the entire universe to be one huge, complex wave packet. In other words, we don't think of the photon as one wave packet, the detector as another, and the human observer as still another wave packet. We are all part of one continuously-joined wave packet. And everything that happens in the universe is just the result of the motions of this vast wave packet.

Now in quantum mechanics we encounter many situations where a particle goes along its merry way, interacts with a scatterer or a detector, and as a result several different things may happen. For example, in the experiment we have been discussing, the photon after encountering the half-silvered mirror may be detected at A or it may be detected at B. Conventional quantum mechanics says: there is some probability that one thing will happen and some probability that the other thing will happen, but only one thing will happen at a time.

The many-world theory says just the opposite. It says *both things will happen.*

How can both things happen when we only observe one of them? This is the heart of the theory. Whenever something happens that has more than one possibility, the universal wave packet splits into a number of branches, just as the wave packet hitting the half-silvered mirror splits into a transmitted and reflected wave. Since the observer is part of this universal wave packet, the observer is only aware of the branch that he happens to be on. So he sees only one result of the measurement. But somewhere else the other thing is happening on another branch of the split universe. And there is a twin of the observer riding on that branch watching that thing happening.

Science fiction readers will recognize this theory as being none other than the alternate-universe plot so beloved of many writers.

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But with a vengeance. It requires the universe splitting every time any kind of interaction happens, which means over 10^{100} copies of the universe being produced every instant! This sounds utterly unreal at first hearing, but basically it's no worse than a wave packet splitting in two at a half-silvered mirror. It's just a more complex packet.

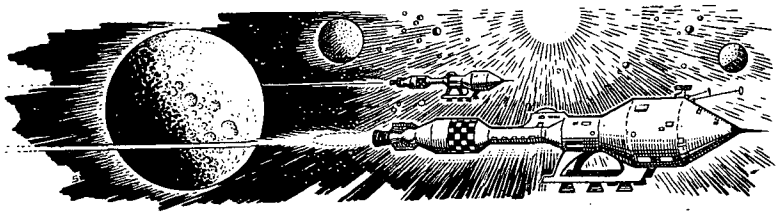
Of course, the Everett theory contains much more than the bare statement given in the above paragraphs. There is a great amount of complex mathematical development to it. But the final result is that the theory gives the same results and predictions as conventional quantum mechanics, and therefore there is no way of testing the theory to see if it makes any difference whether you believe it or not. It is simply another way of looking at the world. The point is that, farfetched as it sounds, the many-worlds interpretation is as good a way of looking at the universe as any other way. Indeed, people such as Bryce DeWitt think it's the *only* way.

At this point we see that the simple experiment performed with a light bulb and four mirrors has brought us into the deepest levels of philosophy and foundations of physics. The way we interpret the experiment depends entirely on the way we look at reality—whether we are "naive realists" or "positivists" or even "idealists."

In this connection I must take issue with Kate Wilhelm, who, in her introduction to *Nebula Award Stories Nine* (Harper & Row, 1975), says, "With Francis Bacon's formulation of the scientific method, the separation of science from philosophy began; by now there is little, if any, connection between them."

Quite the contrary. As we have seen, the kind of physical theory you choose depends on your philosophical orientation—the way you look at the world. Epistemology as a branch of philosophy is alive and well, even though it now goes under the heading of "Philosophy of Science."

And that's what we've been talking about.



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SHAWNA, LTD.

by Frederick Longbeard

art: George Barr

SHAWNA — (Supraliminal Hegelian Absolutized World Neotranspatial Amplifier) a device that amplifies the component of mind that creates and alters reality. SHAWNA theory, rooted in the work of the early idealistic philosophers, was first made practicable in 2134 by physicist-philosopher Leonid Veggnitz, at which time it was first used in transportation over multi-parsec distances (See: Shawna, Ltd. under Space Lines, Commercial).

—*Encyclopaedia Galactica*

As the huge, swept-wing liner taxied out to the run-up pad at the end of the runway, Enoch Rawls began wishing he had never taken up Leonid Veggnitz's offer. The brain behind SHAWNA, Ltd. had coaxed the semanticist into converting the premises and applications of SHAWNA theory and flight from Aristotelian to Non-Aristotelian logic. "Soup it up," as Veggnitz put it. The philosopher pilots he had been introduced to as he took his seat in the cockpit

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seemed confident enough, but Rawls had never been up before. As the engines grumbled, he turned to his right. Captain Sanford, director of the spaceline's philosophical flight school, looked back. "Is there something the matter, Doctor?"

"Captain, why does this ship have engines? I thought all we had to do was think our way to Betelvane."

Sanford chuckled and nodded his head toward the four pilots in the seats forward of theirs. "They have to get us into the air first. Otherwise, we'd leave a dandy hole in the runway. Because of the extra weight we'd pick up, we probably wouldn't make our destination."

"I see."

"SHAWNA flight is limited right now, but as I understand Doctor Veggnitz, he hopes that your work will make us SHAWNA, Unlimited—bigger payloads with fewer philosophers."

Rawls nodded and looked toward the front. First Philosopher Wheeler reached to a panel, picked up a mike, and keyed it. "Tower, this is SHAWNA one one seven, PFR to Betelvane, over."

Rawls saw the First Philosopher listen into his headphones.

"Roger, tower; one one seven cleared for immediate take-off." Wheeler turned to his right. "Okay, Hansen, throw the coal to it." The one called Hansen, Second Philosopher, grasped the throttles with his left hand and gradually pushed them forward. The ship trembled and began rolling forward.

Hansen called off the markers as they rolled down the runway. "Twenty . . . nineteen . . . eighteen . . ."

Third Philosopher Valdez called off the airspeed. "Ninety . . . one-thirty . . . one-ninety . . . two-eighty, and rotate!"

Rawls felt his stomach sink to his lap as Wheeler pulled back on the wheel, shooting the great craft up into the atmosphere. Wheeler nodded at Hansen. "Gear up."

Rawls' buttocks quivered as he heard the multiple whine-clunk of the landing gear retracting.

"Gear up."

"Flaps."

"Flaps up."

"Heading two one zero."

"Two one zero."

Rawls watched as the philosophers flicked switches, turned knobs, and pulled at controls. Wheeler turned a knob and then keyed his mike. "This is the First Philosopher, Captain Wheeler, speaking. Welcome aboard SHAWNA flight one one seven enroute to Hajii Field,

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Betelvane. We will be at jump altitude in approximately eight minutes, and we estimate Hajii Field at 2:72, interstellar standard time. Local time will be 8:91. Enjoy your flight, and please pay attention now while the stewardess in your compartment explains the ship's emergency equipment and procedures. Thank you." Wheeler hung up the mike.

Rawls felt a hand shaking his arm. He turned toward Sanford. "Yes?"

"Before the jump, I should explain what you are going to see, since neither of us will be allowed to talk during the jump." He smiled. "Distracting the philosophers during the jump could be very dangerous."

"I see."

Sanford pointed at the four philosophers. "Those seats swivel around, and they will turn at jump time. This is so they will not be looking out of the window. You see those helmets suspended from the overhead?"

Rawls looked up and saw four gold helmets, coils of red and orange wires leading from them, dangling from hooks. "Yes. Are they the links to the amplifier?"

Sanford nodded. "They'll put them on after they've turned. You see, they can't chance having their vision contradict their thinking about where they are."

Rawls nodded. "I can see why, but what about simple human doubt? I know these flights have been going on for years, but I have doubts."

"These philosophers are the cream of a very select crop. They are screened and re-screened until the last doubting Thomas is removed, then screened again." Sanford smiled and raised his eyebrows. "I think you can see why we can't afford a rogue skeptic getting into the driver's seat."

Rawls nodded, then the cockpit door opened. A stewardess entered carrying a cup-laden tray. "Coffee, fellas?"

She carried the tray to the four philosophers, who each took a cup, then she turned toward Rawls. "Coffee, Doctor?"

Rawls took a cup. "Thank you." Sanford took a cup, and as the stewardess left, Rawls sipped at the steaming brew. He was half-finished as the philosophers put the ship on autopilot and swung their chairs around. Wheeler smiled at the Doctor, then reached down and placed his coffee on the deck. Then, he reached up and pulled down the helmet above his seat and placed it firmly upon his head. The other philosophers did the same.

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Sanford leaned over to Rawls. "Doctor, until after the jump, we must do no talking."

Rawls nodded and watched the philosophers. Wheeler loosened his necktie, checked to see that the other philosophers were wearing their helmets, then turned to Hansen. "Right, Dicky, engage the amp."

"Check." Hansen fiddled with a small panel of knobs recessed into the armrest of his chair. "Amp engaged, power reading at 100 percent, all green."

Wheeler turned to the Third Philosopher. "How are we holding up, Pancho?"

Third Philosopher Valdez checked the instruments on the console attached to his chair. "Airspeed four twenty, altitude twelve thousand, bearing two one zero, all green."

Wheeler turned to the Fourth Philosopher. "Anything in the way, Tony?"

The Fourth Philosopher examined the CRT readout next to his chair. "All clear, Captain."

"Very well, engage the sweep." Wheeler turned to Rawls. "The sweep is what we call the field that moves out from the ship to exclude organic materials from the jump area. It wouldn't do if we brought an air pocket full of germs with us to Betelvane." Rawls nodded.

The Fourth Philosopher looked up from his controls and turned toward Wheeler. "Clean as a whistle, Captain."

Wheeler nodded. "Are we ready to throw the old scow into Berkeley, then?" The other three philosophers nodded. Wheeler faced to his front, stabbed several buttons set into his chair's armrest. "Into first, then: objects depend on mind for existence; objects have no meaning apart from the knower, and the knower is mind; objects cannot exist apart from mind."

Rawls watched as the four philosophers concentrated on the statements. Wheeler looked at the others. "Are we ready to shift into second?" The other philosophers nodded. Rawls looked out of the nearest window and saw no difference. Wheeler cleared his throat. "Terms and relations logically determine one another; ultimate reality is a system of judgments; truth is defined in terms of the relation of these judgments in the formation of a consistent whole."

Rawls noticed that the sky had taken on a curious blue-purple shade, and the clouds a rippling sheen. Wheeler pulled a hanky from his pocket and dabbed at his forehead. The First Philosopher looked at his fellows, then took a deep breath. "Ready for third,

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lads?" Nods all around. "Here we go, then: subject and object are reciprocally dependent upon each other; there can be no subject without an object and no object can exist without a subject; complete reality is a unity of subject and object."

Outside, the sky began pulsing from red through purple to black, then back to red. The clouds radiated with a metallic gold color. Wheeler dabbed again at his forehead, then looked at the Second Philosopher. "Very well, Dicky, run the dissolve tape."

"Check." Hanson jabbed a button, and Rawls watched as the four philosophers went rigid. Outside, the golden clouds blurred, then melded into the purple sky. The sky itself faded until there was nothing—not even the color black. Rawls felt a poke on his arm, turned toward Sanford, and took the note from Sanford's hand.

"Dissolve tape runs at high speed, philosophically showing this reality dissolving. Creation tape will construct the reality of this ship being in Betelvane's atmosphere." Rawls nodded his understanding, then turned his attention back to the philosophers. Wheeler came out of it, shook his head, and looked over the faces of the others.

"Anyone for a break? Pancho, you look all in."

Valdez shook his head and gasped for air. "Let's get it over with, Captain. I'm up for it."

"Are you certain? I can have a stewardess bring in coffee."

Valdez shook his head. "I'm okay."

"Very well. Anyone else?" Wheeler saw the heads shaking, then he turned to Hansen. "Run the Betelvane tape, then, Dicky."

Hansen put his hand to the control. "Betelvane tape, check."

The philosophers went rigid again as the blankness outside the cockpit filled in with pale blue sky, high thready cloud formations, and strange reptilian flying creatures. Wheeler and the other three officers sagged in their chairs, then Wheeler sat up. "There we go, Doctor Rawls. Another successful jump." He turned to Valdez. "Pancho, what shape are we in?"

Valdez, a dazed look in his eyes, squinted at the controls. "On the button, Captain. Airspeed four twenty, altitude twelve thousand, bearing two one zero. Hajii Field in . . . fourteen minutes." Valdez slumped back in his chair.

Wheeler nodded at the Fourth Philosopher. "Tony, take over Pancho's console after you collapse the field, will you? He looks all in."

Valdez smiled at Wheeler, then closed his eyes. "Thanks, Captain."

Wheeler looked at Rawls as Hanson swung his chair around. "We

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have to keep the helmets on for a while, but it's all right to talk now."

Rawls nodded. "Thank you, Captain Wheeler. That was quite impressive."

Wheeler turned his chair and faced the front as Sanford leaned toward Rawls. "You see, Doctor, the reality of Betelvane has changed since that tape was made. They must keep linked to the amplifier to program the new tape, and also to establish our own part in this reality. You know, sort of firm things up a bit."

Rawls nodded, then rubbed his chin. "My mind was so occupied with what was happening during the jump, I really didn't have time to consider the application of Non-Aristotelian logic to the arguments. I suppose the application should extend to the tapes too?"

Sanford nodded. "This is merely a familiarization flight, Doctor. I suppose your real work will be done in the science research center at SHAWNA back on Earth. But, offhand, what do you think?"

Rawls pursed his lips. "Well, Captain Sanford, the first step in the transformation of any system from Aristotelian to Non-Aristotelian logic is the problem of identity. Your flight propositions are rooted in Aristotelian identity: mind is matter; matter is mind; **A** is **A**. One of the foundations of Non-Aristotelian logic is that **A** is almost never **A**."

Wheeler laughed and turned his chair around. "Come now, Doctor. I don't think anything could be more self-evident than **A** is **A**."

Rawls pulled a pen from his pocket and scribbled "A is A" on a scrap of paper, then handed it to Wheeler. "Now, Captain, you agree with that statement?"

Wheeler shrugged. "Of course."

Rawls smiled. "The word 'is' in that statement functions the same as the equal sign in mathematics. The statement, as it is used, means that the propositions, objects, realities, or whatever, on either side of the word 'is' are identical; that is, equal in all respects. Look at the paper and you can see that they obviously are not equal in all respects. With my handwriting, I'm certain that the letters are shaped differently, and they are on different sides of the word 'is'. I'm sure I used more ink on one than the other, and so on."

Wheeler studied the paper. "But, Doctor, this is a piece of paper stating or symbolizing a concept, and on the conceptual level, **A** is **A** is a tautology."

Rawls nodded. "But, Captain Wheeler, language—that is, symbols—is only a map to reality. Language is not reality; a map isn't the area it describes. I defy you to find one instance of identity in

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the real world. You might say an apple is an apple, but *is* apple number one equal in all respects to apple number two?"

Wheeler studied the paper, frowned, then shook his head. Sanford lifted his hand and found it covered with black goop. He felt the armrest under his other hand going mushy. "Wheeler, stop thinking about that! We're into a dissolve phase!"

Wheeler looked up, saw the structural braces of the cabin bending. "Hanson! Hanson! Run the Betelvane tape again, on the double!"

Hanson looked over the back of his chair. "I can't, Captain! I . . . I don't believe it, but we're in Hegelian Overdrive!"

Wheeler swung around and took over Hanson's console. Rawls looked at Sanford. "What's happening?"

Sanford wiped a hand over his face. It came away wet. "Hegelian Overdrive. It's only been theorized so far; this is the first time—" Sanford turned to Rawls. "We've had reality go soft on us before, but another run of the tape usually cures it. But this . . ."

"I don't understand. What's Hegelian Overdrive?"

"The ontological argument first used to . . . prove the existence of a supreme being founds the theory for the Overdrive. . . ." Sanford looked around Rawls, his eyes widening. "Wheeler, it's Valdez! He's *praying!* Get the damned helmet off of him!"

The Fourth Philosopher reached out and pulled Valdez's helmet from his head. Valdez wrung his hands. "God, we're dissolving. Heavenly Father, please accept this, Your most unworthy child to your bos—"

"Shut up!" screamed Wheeler. Valdez appeared to come out of it. "What— what happened?"

Rawls stood and went to the window. As far as he could see, a carpet of soft billowing clouds spread before them. In the distance, tall gleaming spires glinted with an inner light. A being garbed in flowing robes, playing a harp, flew by the window, then into the distance. Rawls turned and faced Valdez. Wheeler was shaking the Third Philosopher by his collar. "You idiot! How did you ever get through screening?"

Valdez blubbered as he held out his hands. "Captain, I haven't thought about religion since I was a boy! It's just . . . I was scared, Captain!"

Rawls saw Sanford turn from the opposite window. "Valdez?"

"Yes, Captain Sanford?"

"Do you believe in Hell?"

Valdez shrugged. "I don't know, Captain. I didn't even know I

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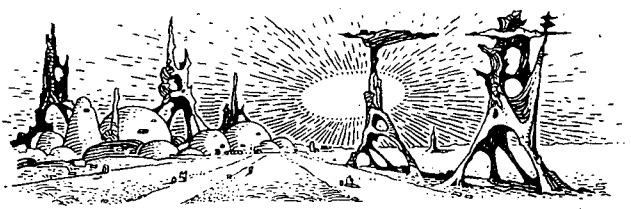
believed in Heaven. Why?"

Sanford turned back to his window. "There's a guy out there with a long beard and a big book, making a list and checking it twice." He turned back toward the others. "And I don't think he's Santa Claus."

Rawls gulped and turned back to his own window. A group of cherubs were playing king of the mountain on a cloud below. *Dear me,* thought Rawls, *I wonder where semanticists are sent? I hope my bag doesn't get lost in the confusion.*



SECOND ANSWER TO DRACULA MAKES A MARTINI
(from page 61)

Place the 26 black cards of a deck in one pile. Next to it place, say, 13 red cards. Turn your back and ask someone to take as many cards as he likes from the black pile and shuffle them into the red pile. Then take the same number of cards from the former all-red pile and shuffle them into the black pile.

You turn around, massage your temples, and announce that your clairvoyant powers tell you that the number of red cards among the black is exactly the same as the number of black cards among the red.

This must always be the case, and for the same reason given in the solution to the martini problem. If you like, you can let a spectator shuffle the two piles together, then deal 26 cards into one pile and 13 into a second pile. The final result will be the same as before.

Now go back and re-read the first part of this feature. What whopping error was made in describing Count Dracula's mixing of the cocktails? See page 119 for the answer.

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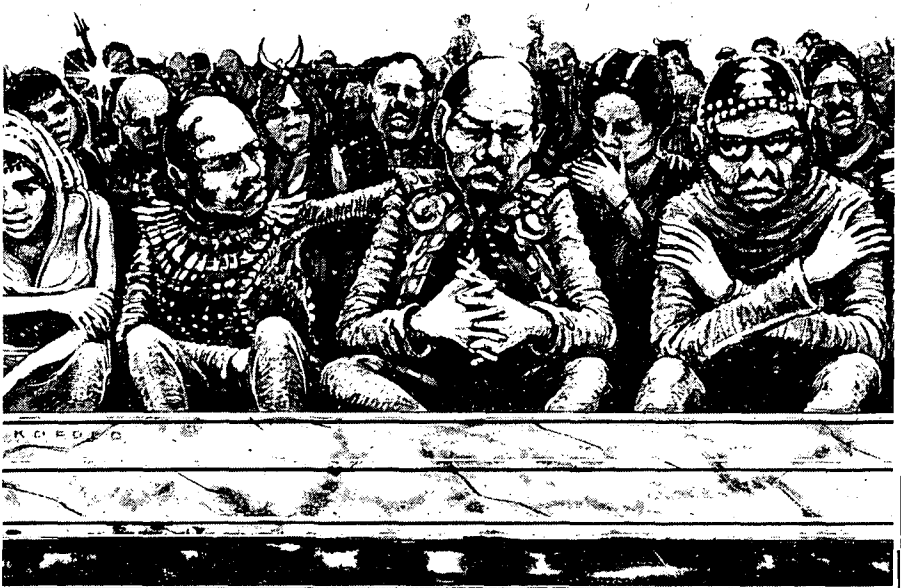

SOLO

by Steve Perry & Jesse Peel

art: Karl Kofoed

Mr. Perry and his family have recently moved from Louisiana to Oregon, where he's the latest addition to the large and flourishing colony of SF writers in that wet and rainy state—at least, it's rainy in the suburbs of Portland, where Mr. Perry reports he's exchanged warm rains for cold with his move.

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Most of the two hundred Spe'lar had come to jeer. Not aloud, of course—they were too refined—but their silence would be more damning than the loudest catcalls and hisses.

Carl took a deep breath. Disapproval would be bad; there might be those in the audience who wished him worse—some who might try to carry out the rumors Theem had mentioned.

Assassination.

Until now, he'd been an unknown quantity, a rumor, an oddity, a potential—but no threat; he was only a Terran, after all, no problem.

Yet.

But those things weren't important—not compared to the *real* reason he couldn't fail!

The hall was almost filled. Through the dim lights the Spe'lar preferred, Carl could see groups of the tall, thin-limbed, barrel-chested creatures moving to their seats. The silence was almost tangible, a dark shroud covering them, weighing heavily upon the assembly.

Alone on stage, the sharp, tangy odor of the tjing-oil on the arofloj's key-pivots filled his nose, dilating his nostrils with its strength.

His short and thick fingers shook, but he covered the motion by clutching the arofloj tightly. Even the four waldoes had a non-intention tremor, driven by the other jittery muscles of his nervous body.

Nervous? Oh, yes he was nervous! He hadn't been so nervous in six years—

—had it really been *six* years?

God! And how many years before that? A decade-and-a-half? Nearly all his life!

From the wings, Theem smiled reassuringly. In the subdued light, Carl saw him twirl the seven fingers of his right hand in the Spe'lar sign for good fortune.

His mouth was too dry. Aye, he thought, I'll need good luck! He managed a weak smile back at Theem. This was important to the Spe'lar, too, perhaps as important as it was to Carl. Maybe more so—his reputation would suffer more than Carl's. If he failed . . .

Carl was a violin string, stretched too far, ready to break—!

Then he knew it was time. There would be no introductions; they all knew who and what he was—there was no need for lily-gilding. They had all come for one thing, one thing only, and that would stand or fall on its own, no excuses, no disclaimers.

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Carl lifted his eyes slightly, to stare unseeing at the dark ceiling. Damn you! he thought. Whatever hell you inhabit, damn you!

Six years! For this single moment, this brief instant, here, now—he'd get no second chance—it would have to be right—this was it!

He took another deep breath, glanced again at Theem, and raised the arofloj, oh-so-carefully. Lightly, he rested his fingers—all fourteen of them—on the keys. Being basic Terran, he'd only been born with the usual ten fingers, unlike the Spe'lar. Those extra four digits had cost him—in pain, in time, in money. All too soon, he'd know if they'd been worth it.

With a motion so automatic it was now nearly a reflex, he formed the proper embouchure of lips, tongue, teeth, and blowhole with the shining brass instrument.

And with that motion, his nervousness ebbed, and he became one with the arofloj.

Softly, he began to play.

Carl had turned back to look at Vaughan, and smiled a bitter smile. "I wish you hadn't said that." His voice was almost a whisper.

Fat Jack nodded, then shrugged. "I could hardly deny it any longer. I *know*—and I suspect you already knew, anyway. My admission was hardly needed."

It was true. Carl *had* known—oh, not for long—but he'd known, just as Jack'd said. Modesty was all well and good, but inappropriate when false. Still, he didn't have to face it, if Jack hadn't said it . . .

He stared at the flute in his hands, his mind focused time and space far away.

"Is it so terrible," Jack asked, "to be the best flutist on Earth—probably in the Galaxy? At *your* age?"

He meant it as a kindness.

"Yes," Carl answered, "it is."

"But why?"

"When you were my age—twenty-six—what did you look forward to? What did you want more than anything?"

Jack smiled, the broad grin creasing his heavy face. "Two things: one was to be thin." He glanced down at his vast paunch. "Afraid I failed in that! The second was to be the greatest artist in the world with a flute."

Carl nodded. "That one you managed."

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"Ah, but look how long it took me! I was well over, let's say, fifty, and after *he* died! And here you've come along and out-done me! Not that I mind—I was the best for some years, if I do say so myself, but—"

"—now I am."

"Yes. Of course, maybe genes had something to—"

Carl jerked his head around and up sharply to stare at Jack. "No!"

"I've only partially achieved my goal," he said, softer. "You say I'm the best—how good is that?"

Jack shook his head, knowing what Carl was asking.

"You want the truth?"

"Yes!"

"Not as good as *he* was."

There was no joy in Carl's smile. He'd known that too.

Jack forced a short laugh. "Don't worry! You'll get better. You're young—"

Carl stared at the floor. No. He had accomplished part of what he'd wanted—no, not so much wanted as had to have—the thing which had driven him all his life; the obsession which had bent his mind from the age of ten, shaped his life, twisted his psyche. He'd learned to play the silver tube, spent countless thousands of hours practicing, learning, working, getting better, reaching new limits—

—and yes! Now he was the best. Now. Someday, he might be better. . . .

But in the past, there was one who would always be remembered as the best. A man who had magic in his lips and fingers, the flutist every great player was always compared to—always ranked under—the immortal Adolph Viren—the greatest master of the flute to ever live—!

Adolph Viren.

Carl's father.

Dead ten years now, but still ever-present in Carl's mind.

He looked down at his short and stubby fingers, and remembered those of his father; long, thin, perfect for his instrument.

You don't have the hands, his father always told him. You'll never be *really* good. . . .

Never as good as I!

The first notes were right, he knew. The bass boomed with appropriate, deep power; the high trill-runs were on key; the tune

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carried correctly, with proper force. But that early section was merely a warm-up, merely an introduction—any moron student could do as much without screwing up—

—Any moron *Spe'lar* could . . .

But Carl was only a Terran, the most basic of all stocks, and he only had one minor modification, non-genetic at that—the waldo-phalanges that jutted from the metal-and-plastic metacarpals and carpals built onto his hands and wrists. No lung had been added, no lip, no tongue. Only the extra fingers—hardly anything.

He was no longer seeing the audience; but he could feel them, feel their attention pressing upon him, waiting, wondering. He was lost in the much-practiced tune, buried in the depths of the sage-theme of Cutron, the melody of Thull the Hero, as he stalked through the Arrowtree Forest in search of the terrible Fn'ith, for the battle to the death!

The silent Spe'lar listened and watched, as a Terran played *his* intrepretation of *their* legend, on an instrument designed for and by them. The makers had never thought alien hands would finger the wind-driven arofloj—it was made for a fourteen-fingered people.

In six years, Carl had come to know the instrument well. He had also come to know the Spe'lar—not as well—but better than before. He knew of their arrogance, their loftiness, their intentness of purpose. Mostly, he knew Theem. Theem had taught him, not only of the instrument, but of the music, of the complex and intricate music, music *they* loved—almost worshipped. He could well understand their feelings of superiority regarding it.

And in Theem's case, his absolute dedication to the wonderful music of Cutron.

Two hundred experts on that music now sat silently in the dim auditorium, listening, watching, wondering.

And waiting.

Just as his father had.

"You are Theem, the Lauren?" Carl had asked, without much enthusiasm. He was almost too depressed to be nervous—almost.

The taller being lowered his eyelids. "I am."

"I want to learn the arofloj."

Theem smiled. Unlike some others, he was too kind, too polite to laugh aloud.

Carl's hopes, low at best, dropped even lower.

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"I see," Theem finally said. "You are a musician?"

"On my world, yes."

"Why would you wish to learn the arofloj? Those of your stock are not constructed to play it—or fully appreciate it."

Carl looked at his tan-leather flute case, battered from much use, then back up at Theem. At two-and-a-half meters, the Spe'lar was much taller than the human.

"Because, I—I *have* to!" God, he was so very tired and discouraged.

There was a long pause. Carl could almost see the other's mind working; considering, rejecting . . .

"What are you called?"

"My name is . . . Carl Viren."

Theem blinked, and turned his head slightly, as if searching for a memory. "I heard once of a Terran musician named Viren. . . ."

"My father," Carl said flatly. Damn! Even here. . . !

There was another forever pause. Then, "Come in."

Carl's breath caught. Invited inside! He fought to maintain control of himself.

The interior of the house was strange. There were things common to all men, even to those of such genetically-altered stock as the Spe'lar, of course, but there were many things whose function he did not know. In his month on this world, it was the first time he'd been invited inside a private residence.

Theem led him to a large and empty room, bare except for several small cushions on the floor, placed near the room's center. They sat.

He nodded at Carl's case. "Play something for me."

Carl's heart thudded and leaped, his pulse zoomed. A dozen times he'd been turned away from the doors of Laurens—music teachers—those who considered his request an affront, a bad joke. Not only had this one invited him in, he was asking Carl to play! Nervousness flared in his guts like a fire.

Quickly, he assembled the three sections of his flute and blew the scales to show its range. When he finished, Theem lowered his eyelids once again, a signal to begin.

Carefully, Carl started with a simple piece, Pessard's *Spanish Dance in E Minor,* to warm up. Then he moved to a more difficult selection, Chaminade's *Concertino, Opus 107.* As he played, he became twined with the music, his worry about impressing the Spe'lar gone. *This* was real, the music; everything else was only a shadow, a dream.

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Somewhen, he found himself wrapped in *Pan's Serenade to Spring,* amid the trees in the bright glade. Then came Briccialdi's *Il Vento.* He made no conscious choices—the pieces flowed without rational thought, churned from emotion.

Centuries later—eons, more—he found himself balanced on the lip of the Grand Canyon, blowing the final, wailing notes of *Thunder Morning in A,* Fremaux's classic study—and the most difficult piece in his repertoire. Playing the haunting melody, he ran through the cross-fingering and trills, showing the control which had made him the best flutist on Earth—perhaps the second-best to have ever lived.

He finished, looked up; and as if coming out of a trance, he remembered where he was.

Theem the Lauren sat silently for a time, his eyes closed. Finally, he sighed, a deep-chested sound, full of some emotion Carl didn't recognize.

"How old are you?" The Spe'lar asked quietly.

"My age would equal about twenty of Cutron's cycles."

"A child! And yet—!" He sighed again, and looked at Carl's hands, at the knuckles white from their pressure on the flute. "You seem to play your instrument well, though I know little of it; however, the arofloj is a much more complex device. You could not even begin with only ten fingers. . . ."

Carl nodded. "That could be . . . changed."

Theem rubbed at his eyes with long fingers. "No stock has ever learned to master the arofloj except Spe'lar."

"I know."

"There are many among us who do not believe any other than Spe'lar *can* learn to play our music." He seemed angry.

Carl hesitated a moment. "And you?"

"I—I—was never of the First Rank—only the Second. We have a saying: Those who can do; those who can't—"

"—I've heard it," Carl finished.

"Perhaps it is true. But if I am only to be a Lauren—a teacher—I will be the best one I can be.

"My skill as a player is not important—only the music is. I care not if a fish can play—provided he plays well."

Carl twisted the flute in his hands, but said nothing.

"Your father—he was very good?"

Carl held up the flute. "He was the greatest master of *this* who ever lived." He sighed, and admitted something aloud he'd never said before. "Much better than I could ever be." He knew he

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sounded bitter.

Theem nodded. "I see."

After a brief moment of infinity, both looked at each other, pulling themselves away from their vastly different, yet similar thoughts.

Both smiled at the same time.

Carl attacked the difficult jamn-vass section of the composition, knowing it was where his fingering would show the slightest hesitation, the smallest error. The shifts from flat-to-sharp would have to be struck perfectly, otherwise the tune would shriek at the ears. And the ears of his audience were more sensitive than a basic human's; they would detect the tiniest slip in the melody.

Without warning, Thull the Hero stumbled suddenly upon the Fn'ith! The Fn'ith cried, a shrill and vicious caw of rage! Thull bellowed his own war-yell, and attacked—!

"How do they feel?"

Carl had looked at his arms, pale from the spray-on bandages, then up at the Medic. "Like they've been dipped in boiling lead."

"Good! No paresthesia! I was worried some of the peripheral nerves would have to be re-grafted. Obviously, they've regenerated."

"How long—?"

"—before you can use them?" The doctor grinned. "You can pick up small objects in a week or two, with practice. The kind of control you want, well, that will take months—years, maybe—if it's possible at all." He shrugged.

"It's possible," Carl said. He lifted his hands up to look at the two new fingers on each one. Metal-and-plastic these were, powered by a nuclear pack built into a housing on his chest-wall. Odd, how the new fingers with their hand and wrist extensions didn't really look that much out of proportion. He grinned, remembering the old joke: *yeah, but on me it looks good!*

He wiggled his real fingers experimentally. Some pain in them—nothing compared to that in his forearms. With concentration, he managed to clench the muscles in his chest which operated the new waldoes. There was a slight tremor in the units, generated from the nerve-stim-implants in his pectorals and intercostals.

They worked! Not well, not yet, but they worked!

So it would take a while. It was just a matter of time and effort.

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He had plenty of both.

Plenty.

He began holding back air with every breath, saving it by hyperventilating. He would need it, for the longest single passage lay just ahead. He would have to pipe for well over a minute, covering notes from the too-high C, down through almost four octaves to big G, and there was going to be one hell of an oxygen debt incurred—some of those notes would have to be blown hard.

Thull the Hero was wounded! He sprawled fractured on the ground! The Fn'ith squealed with joy, smirked with glee, and moved in for the kill! But wait—it was a trick! Thull wasn't as badly injured as he pretended to be! When the Fn'ith moved in, Thull dropped his sword and grabbed the beast, and they rolled on the mossy ground together! The very earth seemed to shake. . . !

During a lull, almost a resting point before the dreaded phrasing, Carl caught a glimpse of something, over *there,* to his right. In the semi-darkness, a flash of light stabbed at him. For a moment, he had the wild idea it was another player, hoisting an arofloj, about to join in.

A half-second later, his mind made the proper connections, and his memory gave him the true picture: the flash was not from an arofloj—it was from a dartspitter! So Theem was right! There *were* those who felt that threatened.

What could he do? Nothing—not and keep playing. There was nothing to do but stop—and he'd sooner they kill him than do that!

He'd never know if that happened—but neither would anyone else. It would be a partial victory at least.

Anything was better than quitting—failing. To go down trying was no disgrace.

Was it that important to them, important enough to kill? He knew them, he thought, but not well enough. But then, he was merely a Terran, an alien on this world. . . .

In Cutron's thin air, almost any effort had winded him. Now, under the dim red sun, as the sweat poured from his gasping body, he wondered for the hundredth time if the price he was paying was worth the goal. After running nearly five kilometers in the insufficient and cold air, he couldn't move any more.

Memory of Theem's voice stirred him. He could almost see his

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large, violet-eyes looking down on him. "You will have to compensate for your decreased lung capacity by exercise. When you can run twenty kilometers, you should have enough wind to begin."

God! He couldn't go on!

Somehow, he managed to drag himself to his feet, to take several faltering steps before he collapsed once again. His brain swam with carbon dioxide; each muscle was a vast ache, his body knotted with pain.

Twenty kilometers! It would take forever!

Suck the air, dammit, to hell with the dartspitter! The centerpiece approaches, and it *must* be observed correctly! This is where I can't fail—for them, for Theem, for me—for *him*.

Carl played on, and the battle between Thull and the terrible Fn'ith raged on . . .

The weight of his fingers had been too much; he couldn't lift them without pain, couldn't move them without the greatest effort. His arms cramped, his chest knotted, his nerves burned. He couldn't continue, he couldn't—

"Again," Theem said.

"Lauren, I—I—" he stopped.

"Yes?"

Carl looked up at Theem's face, and remembered.

"I—never mind!"

He began again. His fingers slipped and dragged over the thirty-four keys, pressing either too hard or too soft, causing the tune to slip, to waver, to hum, to stream off-key; now sharp, now flat, now gone completely. . . .

But he kept playing, doggedly, the desire to overcome his ineptitude driving him, pushing him. A million years later, he finished.

Theem never hesitated. "Again."

Almost mindless now, Carl obeyed.

He remembered his father, forcing him to play scales, chromatic and odd notes at extreme ranges, notes he'd likely seldom use, if ever.

You'll never get it, Adolph Viren had said. You have your mother's hands—the slut! Too stubby, too gross, just as hers!

And later, when he was alone, in the dark, practicing silently, by feel, just the fingering, the tears ran down his face.

His mother's hands had been good enough to hold him when

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he'd cried, soft enough to pet away his nightmares in the sweaty night, strong enough to stay his father's intended beating for some real or imagined infraction of his iron rules.

His mother's hands! They'd be good enough for this!

He finished the piece, and looked at Theem.

"Again."

Carl sighed. Theem wasn't like his father. He didn't try to mold him into something in which he had no choice. He wanted only to teach, to pass on the music, the beautiful, important music! He drew real pleasure from seeing others, watching Carl learn. Carl knew Theem even hoped he'd be better than his teacher.

Something his father had never done.

The Fn'ith screamed and screamed, and raked its hideous claws at the smaller Spe'lar. Thull only grinned, then swung the recovered sword easily in his seven-fingered hands, chopping, cutting, slicing away at the black-scaled monster. . . .

With as much air as his hyperinflated lungs could hold, Carl stretched, pumped, compressed, and set for the intricate pacing. . . .

The Fn'ith leaped, massive ebony claws outstretched, grasping! Thull stood his ground—nay—he jumped forward, snarling his own rage . . . !

And Carl began the run, lost totally now in the sound and battle, hearing nothing else, seeing nothing else, existing only to play, to sing the saga! He was lungs and fingers and lips, and nothing else. . . .

"No other off-worlder has ever done as well as you have with the arofloj," Theem said. "A number have tried."

Carl said nothing.

"Yet you still have a long path to travel before you can be considered an expert."

Carl nodded.

"And, in the event you *do* succeed in learning more than basic rudiments of the instrument, there may be . . . other problems."

"Oh?" That surprised him.

Theem stood and slowly walked away from the practice cushions to the room's small and high window. He clasped his hands behind his back, the thin fingers twining about his skinny wrists. He looked silently through the window for a moment before he spoke.

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"I have spoken to you of those among us who feel the arofloj is an instrument which should be kept . . . pure. While they say they don't believe any other than Spe'lar can learn to play it, they also don't believe any should be allowed to try."

"I see."

"I don't think you do." He turned from the window to face Carl. "I know you can learn! You can bring new life to our music! And if one Terran can . . ." He shook his head. "I have great pride in you—in myself for being able to teach you. However . . .

"If certain of my . . . brothers knew you were capable of playing the arofloj with any real skill, they might be moved to . . . action."

"Action?"

"You would be a threat to their beliefs, a lump in their dogma. It could be dangerous. This is why I have kept your progress secret."

Theem seemed to be selecting his words carefully. Carl did the same. "I think I understand. Do you think I should quit?"

"No! I mean—ah—I think you should know there are risks. The choice must be yours. There are other things in life than playing the arofloj."

Carl sat quietly for a few seconds, then smiled up at his teacher. "We both know better than that, don't we?"

Theem's face lit with its own broad smile. "Good! I expected no less, but I had to—never mind. That aside, today, we attack the roll-fingering . . ."

His wind was gone, but there were notes left to be sounded. He could feel the audience growing toward him, like a plant, waiting, listening intently. This was where he would fail! Then they could sit back smugly; they could laugh inwardly and congratulate themselves. "Of course I didn't think he could do it! A Terran? Don't be absurd!"

"I knew you couldn't do it, either," his father's voice seemed to drone in his mind.

"The hell I can't!" From somewhere, Carl found a reserve, a few minims of stale air, a third or fourth wind that shouldn't be there—but was. His heart pounded in his ears and wrists and neck, his lungs burned, the CO_2 made him dizzy, his sight started to go—

—but he kept playing!

Ten notes left! Six! God, oh God, two! There, there was the rest, the stop, he could finally inhale. . . !

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"You will, of course, improve." Theem's voice had been smooth, but his tone was high and edgy.

"That's not what I mean! Will I be better in a month? Six months?"

"Naturally, I would expect—"

"Theem!"

"No," he said, with a sigh. "No big jumps from now on. You'll get better, but only with constant practice, over a long time. . . ."

"Then I want a recital. Now."

Theem closed his eyes, then opened them slowly. "It will be arranged."

Carl stared at his teacher, surprised. He'd agreed much too quickly. He'd expected at least a token argument—

Slowly, awareness dawned. "Just out of curiosity, how long have I been ready?"

Theem shrugged. "Two months, perhaps three."

"And you didn't *tell* me!"

"*You* had to know. Besides, I've become . . . fond of you. I was in no hurry to risk having my star pupil vanish when it became known he was capable of playing the arofloj."

"I'm not worried about that."

"You should be," Theem shrugged again. "I am."

The music slowed to a comfortable walk, and the worst was over. He still wasn't home free—he could make a stupid error, ruin the ending and the whole thing—but it was easier, now. He had vindicated Theem; he had accomplished something no other human had done—he had shown his father—with his short, useless fingers and bits of self-actuated machinery, he had done it. Almost.

Thull had slain the Fn'ith! Now, he dragged the carcass home, to show his fellow Spe'lar—they were free of the threat!

Carl risked a look at the audience, at the spot where he'd seen the gleam of the dartspitter. It wouldn't matter now—

—but wait!

Where the potential assassin had stood, flattened against the kworl-wood wall in the shadows—there was Theem. And in his hands was the deadly tube.

Theem had taken the assassin. He couldn't use his lips, but the grin loomed big in Carl's mind. Theem had done it. Another risk, taken for his pupil, added to the years he'd risked.

It was almost over. If he could just hang on, there was only one

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more section that was the least bit difficult, and it was nothing compared to what had gone before.

All he had to do was coast—

—No! That wasn't the way! He had to take the risk, he had to try the thing he'd practiced alone, away from Theem's watchful eye. To do less would be cowardly. He owed it to Theem, and he owed it to himself. This will be for you, mother. I will finish in grand style—or I'll screw it up completely!

When the final three-second pause came, just before the coda, he'd decided. He lifted and spread all his fingers, except the supporting thumbs, so the audience could see each digit. Quickly and deliberately, he folded the four waldo fingers shut—leaving only his own real fingers to play the ending.

The audience gasped, as one being.

Ten fingers, they'd be thinking. It can't be done!

His joints burned and hurt, the nails on each finger grew dead-white, each tendon ached. Carl stretched, he forced his fingers into a blur over the keys to the end of the saga.

Thull arrived home with the dead Fn'ith—there was a cheer from his fellows as they saw the body—

—it mixed perfectly with the cheer Carl heard when he removed the arofloj from his lips and somehow stood and bowed to the assembled Spe'lar. Amid the noise, he raised the arofloj in silent salute to Theem—and in triumph to his long-dead father.

Tomorrow, he would see the notices from the critics. He would read the tiny details they picked to assess his performance. Oh, he wasn't the greatest player on Cutron by any means! The critics would be quick to point that out. A credit to his teacher, for certain. Adequate, but not spectacular, aside from that sophomoric gesture near the end. . . .

Those things wouldn't matter. He'd been accepted! He'd done something no other man had done—they didn't care that he was human, most of them—they cared only for the music.

He was, the critics would point out, certainly no threat to the best.

Carl would grin when he read that, and he'd look down at his stubby fingers with their artificial cousins—his mother's hands—and he'd laugh aloud.

Yet, he'd say, mostly to himself, but partially to a dead man.

Yet.

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This tale touches on seve
author's (and the editor's,
matter) weaknesses, for it's a
of a pastiche, ending in
complex horrid pun

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"Murder or suicide, Doctor?"

B. Watson Goodwin shifted in his chair and immediately wished he'd kept his mouth shut. But the man he had spoken to seemed not to notice; he kept on shuffling through the pile of papers and photographs on his desk, pausing now and again to adjust the thick spectacles that rode low on his beaklike nose.

Goodwin did not feel like a Field Operative of Earthsystem Security Forces, though that was what he was. The role of Starcop bothered him. He didn't feel big enough for it. Now he was in the company of the man reputed to be Earth's greatest authority on extraterrestrial planets, and he felt very small indeed.

Dr. Willkie Moon, Earth's greatest and so forth, pushed his glasses up his nose once more—a gesture Goodwin now knew to be futile—and sat back in his chair. "Murder?" he said. "A man is found dead, on a tiny planet where he is the only living being, and you ask me if it is murder?"

Goodwin cleared his throat, and felt himself shrink another few centimeters. "Well, ordinarily, Doctor Moon—of course not. But there is the matter of the recording device, on Harfleur's night side."

"The recording device did nothing on the night side?"

"Actually, Doctor, it did, but—if you'll read that page of the report—"

"Never mind," said Dr. Moon, with a considerable sigh. "I have read it. What I would like you to do is summarize the events in your own words."

"Very well, Doctor." Goodwin looked around Dr. Moon's lodgings, trying to settle his nerves. He was surrounded by the artifacts that every professor of long tenure acquires: dozens of books, each reprinting an article Dr. Moon had written in his freshman year; one hundred and forty-five pipes of various descriptions, each one matched to a cardigan sweater with patches on the elbows; a group portrait of the professors who had officiated at Dr. Moon's orals, with large red crosses drawn over those who had died. It was said that Dr. Moon had not left this room in the past twenty-two years. It *was* true that the rug badly needed vacuuming, but it wasn't that bad.

Goodwin finally gathered his *chi* and began:

"Harfleur, Meade's World, is a barren and airless rock some two thousand kilometers in diameter. It appears to be rather similar in type to Earth's Moon—uh, satellite—"

"I know what the thing's called," said Dr. Moon. "Go on."

"Uh—so it was decided to do a long-term examination, in light of

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the considerable mineral wealth extracted from our own Moon.

"A string of high-density disc recorders was established around Harfleur's surface, each capable of storing three months' environmental data before the disk needed replacing. The recorders are fully automated and highly reliable. However, we provided one human backup; a geologist named Bruce Dee. Dee was given a complete pressurized station, with full recreation facilities and a triple-redundant communication system with Earth."

"Only one man?"

"Dee was a loner by nature. We've found that two-person teams—of whatever kind—wind up hating each other within a few weeks. So if we can't justify the expense of a full team, we send one solitary type. It's worked just fine."

"Until now."

"Until now. About two weeks ago the winter season was ending on Harfleur—there are no real seasons, of course; that's just what we call the period it spends at aphelion. It was time to pick up a set of discs and resupply Dee's station.

"We found Bruce Dee slumped over one of the recorders, dead. His suit was intact, but the heating system was completely off. He appears to have died of freezing."

"I assume his energy supply was intact."

"The suits are plutonium-fueled, and the power pile was operating normally. Even if it had not been, his surface-scooter was less than thirty meters away, and it has an auxiliary power socket for such emergencies."

Dr. Moon picked up a photograph. It showed a pressure-suited figure lying face-down on something like a two-meter metal spider: the recording station. One of the man's gloved hands was tight on the recorder's sampling claw.

"No," said the extraterrologist, "it does not have the look of suicide. But . . . murder? By whom, and for what?"

"We don't know, Doctor. But we do know this: Harfleur is completely lifeless, as nineteen of the twenty recorders we planted attest. But the twentieth—the one where Bruce Dee died—"

" 'Reports presence of organic molecules.' Very interesting." Dr. Moon put the report down. "So you feel that perhaps some mysteriously hidden native of the planet killed Mr. Dee by some means unknown to science."

"Not necessarily! I mean . . . I have a hypothesis."

"Tell me."

"It could have been someone trying to tamper with the recorders,

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to make us lose interest in the planet—then move in himself and mine the place out."

"An excellent hypothesis."

Goodwin grew four meters in an instant.

"Requiring only the presence of a claim-jumper who can walk around without a pressure suit."

Goodwin shrank five meters.

"I wonder—I wonder. Would you do something for me, Mr. Goodwin?"

"Certainly, Dr. Moon. And call me Watson, please."

"Only if I must. Have ESF scrape the late Mr. Dee's left suit glove—the one he was gripping the sampling claw with. And this photograph, of the interior of Mr. Dee's quarters—have it blown up as large as you possibly can. One more thing. Get me the complete technical print-out from the recorder in question—no summaries, no condensations."

"At once, Doctor. Would you care to come with me to the lab? It'll save some time."

"Oh, no, no. It's said that I haven't left this room in twenty-two years."

Goodwin smiled as he stood to go. There was no accounting for the eccentricities of the true genius.

Dr. Moon said, "Lost my key then, actually. Too cheap to have the locks changed."

Dr. Moon finished his perusal of the new evidence. "Aha! Look here, Watson; I have it!"

"Have what?"

"Your invisible alien attacker, of course. Here he is, captured upon this photograph."

"Where?"

"In the station waste can. Look closely."

"I see a bottle."

"Watson, you *see*, but you do not—oh, forget it. Indeed it is a bottle, Watson; a bottle that once held Chateau Ganymede '86, fermented from subsurface fungi on Jupiter's moon, a vile concoction. I keep mine in a radioactive-ash-scuttle. There is your murderer."

"You mean Bruce Dee was drunk."

"As the proverbial Tau Cetan, Watson. Now imagine, as I reconstruct our geologist's last moments on Earth—er, Harfleur. Consumed with a loneliness he has never before felt, surrounded by the rocks he once felt to be his dearest friends, Dee takes to drink. He

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soon develops a need for the stuff at every moment of crisis.

"Now, he is going out to inspect the recorders he hates, which pick over the rocks he hates, upon the worldlet he hates. He is going out upon—" Dr. Moon went to the shelf, took down a small ornately-bound book. On the flyleaf was an autograph, facing the title *The Dynamics of an Asteroid*. "—out upon darkside, by my calculations. And before he enters that gloom, he must have a drink. But he is already wearing his pressure suit!

"No matter to him, such is his need. He uncorks the bottle with his gloved hands and, since he is becoming uncomfortable in the suit inside his climate-controlled outpost, he switches off its internal heating.

"And now, full of Ganymedan courage, he leaves his shelter—forgetting to turn his heater on again; for he is fortified against the cold by the effects of too much spirit of toadstool.

"But the heat must fail, Watson; and it does, but he notices too late. And chilled, intoxicated, he falls against the recorder, clutching vainly at its sampling claw with this glove." Dr. Moon waved the silver gauntlet.

"But the organic matter—"

"From the glove, Watson. You made the mistake of reading only the summarized chromatography report, not the complete one. And you did not have my trained eye. I can identify four hundred varieties of tobacco, two hundred and seven imprints of finger, tentacle or filament, *and* three hundred and eighty-two types of wine cork, even when in bits too small to see with the naked eye."

"But," gasped Goodwin, "how was the content of our winter's disc made a spurious summary by this scum of cork?"

"It was elementally adhered, Watson."

THIRD ANSWER TO DRACULA MAKES A MARTINI
(from page 98)

The description said that Mrs. Dracula watched her husband in a mirror. As every reader knows, or should know, vampires don't *have* mirror reflections.

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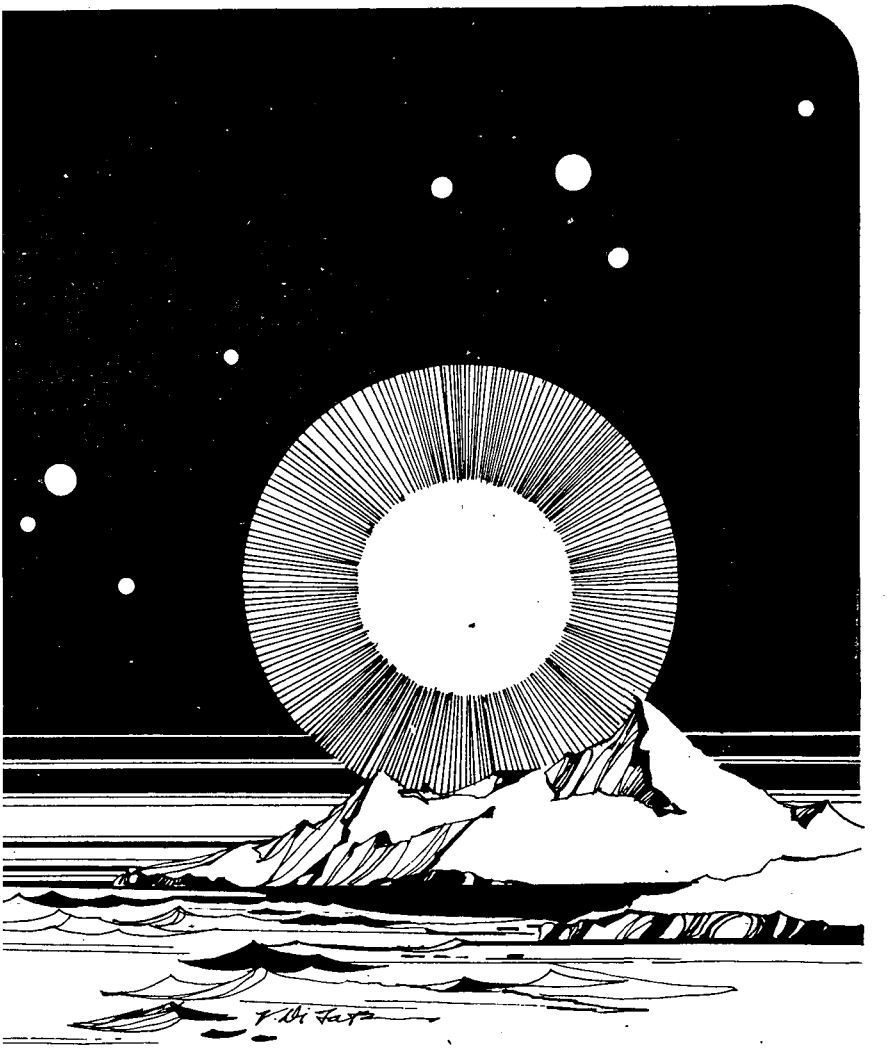

ENEMY MINE

by Barry B. Longyear

art: Vincent Di Fate

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The author, after the usual variety of jobs that seem characteristic of an author's formative years, has settled down to write full time. Physically, Mr. Longyear is sturdy but not plump; in person he's cheerful, easily moved to laughter; and his writing output is an almost frightening 10 to 20 pages a day, when the muse is co-operating.

The Dracon's three-fingered hands flexed. In the thing's yellow eyes I could read the desire to either have those fingers around a weapon or my throat. As I flexed my own fingers, I knew it read the same in my eyes.

"Irkmaan!" the thing spat.

"You piece of Drac slime." I brought my hands up in front of my chest and waved the thing on. "Come on, Drac; come and get it."

"Irkmaan vaa, koruum su!"

"Are you going to talk, or fight? Come on!" I could feel the spray from the sea behind me—a boiling madhouse of white-capped breakers that threatened to swallow me as it had my fighter. I had ridden my ship in. The Drac had ejected when its own fighter had caught one in the upper atmosphere, but not before crippling my power plant. I was exhausted from swimming to the grey, rocky beach and pulling myself to safety. Behind the Drac, among the rocks on the otherwise barren hill, I could see its ejection capsule. Far above us, its people and mine were still at it, slugging out the possession of an uninhabited corner of nowhere. The Drac just stood there and I went over the phrase taught us in training—a phrase calculated to drive any Drac into a frenzy. *"Kiz da yuomeen, Shizumaat!"* Meaning: Shizumaat, the most revered Drac philosopher, eats kiz excrement. Something on the level of stuffing a Moslem full of pork.

The Drac opened its mouth in horror, then closed it as anger literally changed its color from yellow to reddish-brown. *"Irkmann, yaa stupid Mickey Mouse is!"*

I had taken an oath to fight and die over many things, but that venerable rodent didn't happen to be one of them. I laughed, and continued laughing until the guffaws in combination with my exhaustion forced me to my knees. I forced open my eyes to keep

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track of my enemy. The Drac was running toward the high ground, away from me and the sea. I half-turned toward the sea and caught a glimpse of a million tons of water just before they fell on me, knocking me unconscious.

"Kiz da yuomeen, Irkmann, ne?"

My eyes were gritty with sand and stung with salt, but some part of my awareness pointed out: "Hey, you're alive." I reached to wipe the sand from my eyes and found my hands bound. A straight metal rod had been run through my sleeves and my wrists tied to it. As my tears cleared the sand from my eyes, I could see the Drac sitting on a smooth black boulder looking at me. It must have pulled me out of the drink. "Thanks, toad face. What's with the bondage?"

"Ess?"

I tried waving my arms and wound up giving an impression of an atmospheric fighter dipping its wings. "Untie me, you Drac slime!" I was seated on the sand, my back against a rock.

The Drac smiled, exposing the upper and lower mandibles that looked human—except that instead of separate teeth, they were solid. *"Eh, ne, Irkmaan."* It stood, walked over to me and checked my bonds.

"Untie me!"

The smile disappeared. *"Ne!"* It pointed at me with a yellow finger. *"Kos son va?"*

"I don't speak Drac, toad face. You speak Esper or English?"

The Drac delivered a very human-looking shrug, then pointed at its own chest. *"Kos va son Jeriba Shigan."* It pointed again at me. *"Kos son va?"*

"Davidge. My name is Willis E. Davidge."

"Ess?"

I tried my tongue on the unfamiliar syllables. *"Kos va son Willis Davidge."*

"Eh." Jeriba Shigan nodded, then motioned with its fingers. *"Dasu, Davidge."*

"Same to you, Jerry."

"Dasu, dasu!" Jeriba began sounding a little impatient. I shrugged as best I could. The Drac bent over and grabbed the front of my jump suit with both hands and pulled me to my feet. *"Dasu, dasu, kizlode!"*

"All right! So *dasu* is 'get up.' What's a *kizlode*?"

Jerry laughed. *"Gavey 'kiz'?"*

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"Yeah, I *gavey*."

Jerry pointed at its head. *"Lode."* It pointed at my head. *"Kizlode, gavey?"*

I got it, then swung my arms around, catching Jerry upside its head with the metal rod. The Drac stumbled back against a rock, looking surprised. It raised a hand to its head and withdrew it covered with that pale pus that Dracs think is blood. It looked at me with murder in its eyes. *"Gefh! Nu Gefh, Davidge!"*

"Come and get it, Jerry, you *kizlode* sonafabitch!"

Jerry dived at me and I tried to catch it again with the rod, but the Drac caught my right wrist in both hands and, using the momentum of my swing, whirled me around, slamming my back against another rock. Just as I was getting back my breath, Jerry picked up a small boulder and came at me with every intention of turning my melon into pulp. With my back against the rock, I lifted a foot and kicked the Drac in the midsection, knocking it to the sand. I ran up, ready to stomp Jerry's melon, but he pointed behind me. I turned and saw another tidal wave gathering steam, and heading our way. *"Kiz!"* Jerry got to its feet and scampered for the high ground with me following close behind.

With the roar of the wave at our backs, we weaved among the water- and sand-ground, black boulders, until we reached Jerry's ejection capsule. The Drac stopped, put its shoulder to the egg-shaped contraption, and began rolling it uphill. I could see Jerry's point. The capsule contained all of the survival equipment and food either of us knew about. "Jerry!" I shouted above the rumble of the fast approaching wave. "Pull out this damn rod and I'll help!" The Drac frowned at me. "The rod, *kizlode,* pull it out!" I cocked my head toward my outstretched arm.

Jerry placed a rock beneath the capsule to keep it from rolling back, then quickly untied my wrists and pulled out the rod. Both of us put our shoulders to the capsule, and we quickly rolled it to higher ground. The wave hit and climbed rapidly up the slope until it came up to our chests. The capsule bobbed like a cork, and it was all we could do to keep control of the thing until the water receded, wedging the capsule between three big boulders. I stood there, puffing.

Jerry dropped to the sand, its back against one of the boulders, and watched the water rush back out to sea. *"Magasienna!"*

"You said it, brother." I sank down next to the Drac; we agreed by eye to a temporary truce, and promptly passed out.

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My eyes opened on a sky boiling with blacks and greys. Letting my head loll over on my left shoulder, I checked out the Drac. It was still out. First, I thought that this would be the perfect time to get the drop on Jerry. Second, I thought about how silly our insignificant scrap seemed compared to the insanity of the sea that surrounded us. Why hadn't the rescue team come? Did the Dracon fleet wipe us out? Why hadn't the Dracs come to pick up Jerry? Did they wipe out each other? I didn't even know where I was. An island. I had seen that much coming in, but where and in relation to what? Fyrine IV: the planet didn't even rate a name, but was important enough to die over.

With an effort, I struggled to my feet. Jerry opened its eyes and quickly pushed itself to a defensive crouching position. I waved my hand and shook my head. "Ease off, Jerry. I'm just going to look around." I turned my back on it and trudged off between the boulders. I walked uphill for a few minutes until I reached level ground.

It was an island, all right, and not a very big one. By eyeball estimation, height from sea level was only eighty meters, while the island itself was about two kilometers long and less than half that wide. The wind whipping my jump suit against my body was at least drying it out, but as I looked around at the smooth-ground boulders on top of the rise, I realized that Jerry and I could expect bigger waves than the few puny ones we had seen.

A rock clattered behind me and I turned to see Jerry climbing up the slope. When it reached the top, the Drac looked around. I squatted next to one of the boulders and passed my hand over it to indicate the smoothness, then I pointed toward the sea. Jerry nodded. *"Ae, Gavey."* It pointed downhill toward the capsule, then to where we stood. *"Echey masu, nasesay."*

I frowned, then pointed at the capsule. *"Nasesay?* The capsule?"

"Ae, capsule *nasesay. Echey masu."* Jerry pointed at its feet.

I shook my head. "Jerry, if you *gavey* how these rocks got smooth," I pointed at one, "then you *gavey* that *masu*ing the *nasesay* up here isn't going to do a damned bit of good." I made a sweeping up and down movement with my hands. "Waves." I pointed at the sea below. "Waves, up here"; I pointed to where we stood. "Waves, *echey.*"

"Ae, gavey." Jerry looked around the top of the rise, then rubbed the side of its face. The Drac squatted next to some small rocks and began piling one on top of another. *"Viga, Davidge."*

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I squatted next to it and watched while its nimble fingers constructed a circle of stones that quickly grew into a doll-house-sized arena. Jerry stuck one of its fingers in the center of the circle. *"Echey, nasesay."*

The days on Fyrine IV seemed to be three times longer than any I had seen on any other habitable planet. I use the designation 'habitable' with reservations. It took us most of the first day to painfully roll Jerry's *nasesay* up to the top of the rise. The night was too black to work and was bone-cracking cold. We removed the couch from the capsule, which made just enough room for both of us to fit inside. The body heat warmed things up a bit; and we killed time between sleeping, nibbling on Jerry's supply of ration bars (they taste a bit like fish mixed with chedder cheese), and trying to come to some agreement about language.

"Eye."

"Thuyo."

"Finger."

"Zurath."

"Head."

The Drac laughed. *"Lode."*

"Ho, ho, very funny."

"Ho, ho."

At dawn on the second day, we rolled and pushed the capsule into the center of the rise and wedged it between two large rocks, one of which had an overhang that we hoped would hold down the capsule when one of those big soakers hit. Around the rocks and capsule, we laid a foundation of large stones and filled in the cracks with smaller stones. By the time the wall was knee high, we discovered that building with those smooth, round stones and no mortar wasn't going to work. After some experimentation, we figured out how to break the stones to give us flat sides with which to work. It's done by picking up one stone and slamming it down on top of another. We took turns, one slamming and one building. The stone was almost a volcanic glass, and we also took turns extracting rock splinters from each other. It took nine of those endless days and nights to complete the walls, during which waves came close many times and once washed us ankle deep. For six of those nine days, it rained. The capsule's survival equipment included a plastic blanket, and that became our roof. It sagged in at the center, and the hole we put in it there allowed the water to

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run out, keeping us almost dry and giving us a supply of fresh water. If a wave of any determination came along, we could kiss the roof goodbye; but we both had confidence in the walls, which were almost two meters thick at the bottom and at least a meter thick at the top.

After we finished, we sat inside and admired our work for about an hour, until it dawned on us that we had just worked ourselves out of jobs. "What now, Jerry?"

"Ess?"

"What do we do now?"

"Now wait, we." The Drac shrugged. "Else what, *ne?*"

I nodded. *"Gavey."* I got to my feet and walked to the passageway we had built. With no wood for a door, where the walls would have met, we bent one out and extended it about three meters around the other wall with the opening away from the prevailing winds. The never-ending winds were still at it, but the rain had stopped. The shack wasn't much to look at, but looking at it stuck there in the center of that deserted island made me feel good. As Shizumaat observed: "Intelligent life making its stand against the universe." Or, at least, that's the sense I could make out of Jerry's hamburger of English. I shrugged and picked up a sharp splinter of stone and made another mark in the large standing rock that served as my log. Ten scratches in all, and under the seventh, a small 'x' to indicate the big wave that just covered the top of the island.

I threw down the splinter. "Damn, I hate this place!"

"Ess?" Jerry's head poked around the edge of the opening. "Who talking at, Davidge?"

I glared at the Drac, then waved my hand at it. "Nobody."

"Ess va, 'nobody'?"

"Nobody. Nothing."

"Ne gavey, Davidge."

I poked at my chest with my finger. "Me! I'm talking to myself! You *gavey* that stuff, toad face!"

Jerry shook its head. "Davidge, now I sleep. Talk not so much nobody, *ne*?" It disappeared back into the opening.

"And so's your mother!" I turned and walked down the slope. *Except, strictly speaking, toad face, you don't have a mother—or father. "If you had your choice, who would you like to be trapped on a desert island with?"* I wondered if anyone ever picked a wet freezing corner of Hell shacked up with a hermaphrodite.

Half of the way down the slope, I followed the path I had

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marked with rocks until I came to my tidal pool, that I had named "Rancho Sluggo." Around the pool were many of the water worn rocks, and underneath those rocks below the pool's waterline, lived the fattest orange slugs either of us had ever seen. I made the discovery during a break from house building and showed them to Jerry.

Jerry shrugged. "And so?"

"And so what? Look, Jerry, those ration bars aren't going to last forever. What are we going to eat when they're all gone?"

"Eat?" Jerry looked at the wriggling pocket of insect life and grimaced. "*Ne*, Davidge. Before then pickup. Search us find, then pickup."

"What if they don't find us? What then?"

Jerry grimaced again and turned back to the half-completed house. "Water we drink, then until pickup." He had muttered something about kiz excrement and my tastebuds, then walked out of sight.

Since then I had built up the pool's walls, hoping the increased protection from the harsh environment would increase the herd. I looked under several rocks, but no increase was apparent. And, again, I couldn't bring myself to swallow one of the things. I replaced the rock I was looking under, stood and looked out to the sea. Although the eternal cloud cover still denied the surface the drying rays of Fyrine, there was no rain and the usual haze had lifted.

In the direction past where I had pulled myself up on the beach, the sea continued to the horizon. In the spaces between the whitecaps, the water was as grey as a loan officer's heart. Parallel lines of rollers formed approximately five kilometers from the island. The center, from where I was standing, would smash on the island, while the remainder steamed on. To my right, in line with the breakers, I could just make out another small island perhaps ten kilometers away. Following the path of the rollers, I looked far to my right, and where the grey-white of the sea should have met the lighter grey of the sky, there was a black line on the horizon.

The harder I tried to remember the briefing charts on Fyrine IV's land masses, the less clear it became. Jerry couldn't remember anything either—at least nothing it would tell me. Why should we remember? The battle was supposed to be in space, each one trying to deny the other an orbital staging area in the Fyrine system. Neither side wanted to set foot on Fyrine, much less fight

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a battle there. Still, whatever it was called, it was land and considerably larger than the sand and rock bar we were occupying.

How to get there was the problem. Without wood, fire, leaves, or animal skins, Jerry and I were destitute compared to the average poverty-stricken caveman. The only thing we had that would float was the *nasesay*. The capsule. Why not? The only real problem to overcome was getting Jerry to go along with it.

That evening, while the greyness made its slow transition to black, Jerry and I sat outside the shack nibbling our quarter portions of ration bars. The Drac's yellow eyes studied the dark line on the horizon, then it shook its head. "*Ne,* Davidge. Dangerous is."

I popped the rest of my ration bar into my mouth and talked around it. "Any more dangerous than staying here?"

"Soon pickup, *ne*?"

I studied those yellow eyes. "Jerry, you don't believe that any more than I do." I leaned forward on the rock and held out my hands. "Look, our chances will be a lot better on a larger land mass. Protection from the big waves, maybe food. . . ."

"Not maybe, *ne*?" Jerry pointed at the water. "How *nasesay* steer, Davidge? In that, how steer? *Ess eh* soakers, waves, beyond land take, *gavey? Bresha*," Jerry's hands slapped together. "*Ess eh bresha* rocks on, *ne*? Then we death."

I scratched my head. "The waves are going in that direction from here, and so is the wind. If the land mass is large enough, we don't have to steer, *gavey?*"

Jerry snorted. "*Ne* large enough; then?"

"I didn't say it was a sure thing."

"*Ess?*"

"A sure thing; certain, *gavey*?" Jerry nodded. "And for smashing up on the rocks, it probably has a beach like this one."

"Sure thing, *ne*?"

I shrugged. "No, it's not a sure thing, but, what about staying here? We don't know how big those waves can get. What if one just comes along and washes us off the island? What then?"

Jerry looked at me, its eyes narrowed. "What there, Davidge? *Irkmaan* base, *ne*?"

I laughed. "I told you, we don't have any bases on Fyrine IV."

"Why want go, then?"

"Just what I said, Jerry. I think our chances would be better."

"Ummm." The Drac folded its arms. "*Viga,* Davidge, *nasesay* stay. I know."

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"Know what?"

Jerry smirked then stood and went into the shack. After a moment it returned and threw a two-meter long metal rod at my feet. It was the one the Drac had used to bind my arms. "Davidge, I know."

I raised my eyebrows and shrugged. "What are you talking about? Didn't that come from your capsule?"

"Ne, Irkmaan."

I bent down and picked up the rod. Its surface was uncorroded and at one end were arabic numerals—a part number. For a moment a flood of hope washed over me, but it drained away when I realized it was a civilian part number. I threw the rod on the sand. "There's no telling how long that's been here, Jerry. It's a civilian part number and no civilian missions have been in this part of the galaxy since the war. Might be left over from an old seeding operation or exploratory mission. . . ."

The Drac nudged it with the toe of his boot. "New, *gavey*?"

I looked up at it. "You *gavey* stainless steel?"

Jerry snorted and turned back toward the shack. "I stay, *nasesay* stay; where you want, you go, Davidge!"

With the black of the long night firmly bolted down on us, the wind picked up, shrieking and whistling in and through the holes in the walls. The plastic roof flapped, pushed in and sucked out with such violence it threatened to either tear or sail off into the night. Jerry sat on the sand floor, its back leaning against the *nasesay* as if to make clear that both Drac and capsule were staying put, although the way the sea was picking up seemed to weaken Jerry's argument.

"Sea rough now is, Davidge, *ne*?"

"It's too dark to see, but with this wind. . . ." I shrugged more for my own benefit than the Drac's, since the only thing visible inside the shack was the pale light coming through the roof. Any minute we could be washed off that sandbar. "Jerry, you're being silly about that rod. You know that."

"Surda." The Drac sounded contrite if not altogether miserable.

"Ess?"

"Ess eh 'Surda'?"

"Ae."

Jerry remained silent for a moment. "Davidge, *gavey* 'not certain not is'?"

I sorted out the negatives. "You mean 'possible,' "maybe,'

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'perhaps'?"

"*Ae*, possiblemaybeperhaps. Dracon fleet Irkmaan ships have. Before war buy; after war capture. Rod possiblemaybeperhaps Dracon is."

"So, if there's a secret base on the big island, *surda* it's a Dracon base?"

"Possiblemaybeperhaps, Davidge."

"Jerry, does that mean you want to try it? The *nasesay*?"

"*Ne*."

"*Ne*? Why, Jerry? If it might be a Drac base—"

"*Ne*! *Ne* talk!" The Drac seemed to choke on the words.

"Jerry, we talk, and you better *believe* we talk! If I'm going to death it on this island, I have a right to know why."

The Drac was quiet for a long time. "Davidge."

"*Ess?*"

"*Nasesay*, you take. Half ration bars you leave. I stay."

I shook my head to clear it. "You want me to take the capsule alone?"

"What you want is, *ne*?"

"*Ae*, but why? You must realize there won't be any pickup."

"Possiblemaybeperhaps."

"*Surda*, nothing. You know there isn't going to be a pickup. What is it? You afraid of the water? If that's it, we have a better chance—"

"Davidge, up your mouth shut. *Nasesay* you have. Me *ne* you need, *gavey*?"

I nodded in the dark. The capsule was mine for the taking; what did I need a grumpy Drac along for—especially since our truce could expire at any moment? The answer made me feel a little silly—human. Perhaps it's the same thing. The Drac was all that stood between me and utter aloneness. Still, there was the small matter of staying alive. "We should go together, Jerry."

"Why?"

I felt myself blush. If humans have this need for companionship, why are they also ashamed to admit it? "We just should. Our chances would be better."

"Alone your chances better are, Davidge. Your enemy I am."

I nodded again and grimaced in the dark. "Jerry, you *gavey* 'loneliness'?"

"*Ne gavey*."

"Lonely. Being alone, by myself."

"*Gavey* you alone. Take *nasesay*; I stay."

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"That's it . . . see, *viga*, I don't want to."

"You want together go?" A low, dirty chuckle came from the other side of the shack. "You Dracon like? You me death, *Irkmaan.*" Jerry chuckled some more. *"Irkmaan poorzhab* in head, *poorzhab.*"

"Forget it!" I slid down from the wall, smoothed out the sand and curled up with my back toward the Drac. The wind seemed to die down a bit and I closed my eyes to try and sleep. In a bit, the snap, crack of the plastic roof blended in with the background of shrieks and whistles and I felt myself drifting off, when my eyes opened wide at the sound of footsteps in the sand. I tensed, ready to spring.

"Davidge?" Jerry's voice was very quiet.

"What?"

I heard the Drac sit on the sand next to me. "You loneliness, Davidge. About it hard you talk, *ne*?"

"So what?" The Drac mumbled something that was lost in the wind. "What?" I turned over and saw Jerry looking through a hole in the wall.

"Why I stay. Now, you I tell, *ne*?"

I shrugged. "Okay; why not?"

Jerry seemed to struggle with the words, then opened its mouth to speak. Its eyes opened wide. *"Magasienna!"*

I sat up. *"Ess?"*

Jerry pointed at the hole. "Soaker!"

I pushed it out of the way and looked through the hole. Steaming toward our island was an insane mountainous fury of whitecapped rollers. It was hard to tell in the dark, but the one in front looked taller than the one that had wet our feet a few days before. The ones following it were bigger. Jerry put a hand on my shoulder and I looked into the Drac's eyes. We broke and ran for the capsule. We heard the first wave rumbling up the slope as we felt around in the dark for the recessed doorlatch. I just got my finger on it when the wave smashed against the shack, collapsing the roof. In half a second we were under water, the currents inside the shack agitating us like socks in a washing machine.

The water receded, and as I cleared my eyes, I saw that the windward wall of the shack had caved in. "Jerry!"

Through the collapsed wall, I saw the Drac staggering around outside. *"Irkmaan?"* Behind him I could see the second roller gathering speed.

"*Kizlode*, what'n the Hell you doing out there? Get in here!"

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I turned to the capsule, still lodged firmly between the two rocks, and found the handle. As I opened the door, Jerry stumbled through the missing wall and fell against me. "Davidge . . . forever soakers go on! Forever!"

"Get in!" I helped the Drac through the door and didn't wait for it to get out of the way. I piled in on top of Jerry and latched the door just as the second wave hit. I could feel the capsule lift a bit and rattle against the overhang of the one rock.

"Davidge, we float?"

"No. The rocks are holding us. We'll be all right once the breakers stop."

"Over you move."

"Oh." I got off Jerry's chest and braced myself against one end of the capsule. After a bit, the capsule came to rest and we waited for the next one. "Jerry?"

"Ess?"

"What was it that you were about to say?"

"Why I stay?"

"Yeah."

"About it hard me talk, *gavey?*"

"I know, I know."

The next breaker hit and I could feel the capsule rise and rattle against the rock. "Davidge, *gavey 'vi nessa'*?"

"Ne gavey."

"Vi nessa . . . little me, *gavey?*"

The capsule bumped down the rock and came to rest. "What about little you?"

"Little me . . . little Drac. From me, *gavey*?"

"Are you telling me you're *pregnant*?"

"Possiblemaybeperhaps."

I shook my head. "Hold on, Jerry. I don't want any misunderstandings. Pregnant . . . are you going to be a parent?"

"*Ae*, parent, two-zero-zero in line, very important is, *ne*?"

"Terrific. What's this got to do with you not wanting to go to the other island?"

"Before, me *vi nessa, gavey*? *Tean* death."

"Your child, it died?"

"*Ae*!" The Drac's sob was torn from the lips of the universal mother. "I in fall hurt, *Tean* death. *Nasesay* in sea us bang. *Tean* hurt, *gavey*?"

"*Ae*, I *gavey*." So, Jerry was afraid of losing another child. It was almost certain that the capsule trip would bang us around a

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lot, but staying on the sandbar didn't appear to be improving our chances. The capsule had been at rest for quite a while, and I decided to risk a peek outside. The small canopy windows seemed to be covered with sand, and I opened the door. I looked around, and all of the walls had been smashed flat. I looked toward the sea, but could see nothing. "It looks safe, Jerry . . ." I looked up, toward the blackish sky, and above me towered the white plume of a descending breaker. "*Maga* damn *sienna*!" I slammed the hatch door.

"*Ess*, Davidge?"

"Hang on, Jerry!"

The sound of the water hitting the capsule was beyond hearing. We banged once, twice against the rock, then we could feel ourselves twisting, shooting upward. I made a grab to hang on, but missed as the capsule took a sickening lurch downward. I fell into Jerry then was flung to the opposite wall where I struck my head. Before I went blank, I heard Jerry cry *"Tean! Vi tean!"*

. . . . . the lieutenant pressed his hand control and a figure—tall, humanoid, yellow—appeared on the screen.

"Dracslime!" shouted the auditorium of seated recruits.

The lieutenant faced the recruits. "Correct. This is a Drac. Note that the Drac race is uniform as to color; they are all yellow." The recruits chuckled politely. The officer preened a bit, then with a light wand began pointing out various features. "The three-fingered hands are distinctive, of course, as is the almost noseless face, which gives the Drac a toad-like appearance. On average, eyesight is slightly better than human, hearing about the same, and smell . . ." the lieutenant paused. "The smell is terrible!" The officer beamed at the uproar from the recruits. When the auditorium quieted down, he pointed his light wand at a fold in the figure's belly. "This is where the Drac keeps its family jewels–all of them." Another chuckle. "That's right, Dracs are hermaphrodites, with both male and female reproductive organs contained in the same individual." The lieutenant faced the recruits. "You go tell a Drac to go boff himself, then watch out, because he can!" The laughter died down, and the lieutenant held out a hand toward the screen. "You see one of these things, what do you do?"

"KILL IT. . . ."

. . . . I cleared the screen and computer sighted on the next Drac fighter, looking like a double x in the screen's display. The Drac

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shifted hard to the left, then right again. I felt the autopilot pull my ship after the fighter, sorting out and ignoring the false images, trying to lock its electronic crosshairs on the Drac. "Come on, toad face . . . a little bit to the left. . . ." The double cross image moved into the ranging rings on the display and I felt the missile attached to the belly of my fighter take off. "Gotcha!" Through my canopy I saw the flash as the missile detonated. My screen showed the Drac fighter out of control, spinning toward Fyrine IV's cloud-shrouded surface. I dived after it to confirm the kill . . . skin temperature increasing as my ship brushed the upper atmosphere. "Come on, dammit, blow!" I shifted the ship's systems over for atmospheric flight when it became obvious that I'd have to follow the Drac right to the ground. Still above the clouds, the Drac stopped spinning and turned. I hit the auto override and pulled the stick into my lap. The fighter wallowed as it tried to pull up. Everyone knows the Drac ships work better in atmosphere . . . heading toward me on an interception course . . . why doesn't the slime fire . . . just before the collision, the Drac ejects . . . power gone; have to deadstick it in. I track the capsule as it falls through the muck intending to find that Dracslime and finish the job. . . .

It could have been for seconds or years that I groped into the darkness around me. I felt touching, but the parts of me being touched seemed far, far away. First chills, then fever, then chills again, my head being cooled by a gentle hand. I opened my eyes to narrow slits and saw Jerry hovering over me, blotting my forehead with something cool. I managed a whisper. "Jerry."

The Drac looked into my eyes and smiled. "Good is, Davidge. Good is."

The light on Jerry's face flickered and I smelled smoke. "Fire."

Jerry got out of the way and pointed toward the center of the room's sandy floor. I let my head roll over and realized that I was lying on a bed of soft, springy branches. Opposite my bed was another bed, and between them crackled a cheery campfire. "Fire now we have, Davidge. And wood." Jerry pointed toward the roof made of wooden poles thatched with broad leaves.

I turned and looked around, then let my throbbing head sink down and closed my eyes. "Where are we?"

"Big island, Davidge. Soaker off sandbar us washed. Wind and waves us here took. Right you were."

"I . . . I don't understand; *ne gavey*. It'd take days to get to the

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big island from the sandbar."

Jerry nodded and dropped what looked like a sponge into a shell of some sort filled with water. "Nine days. You I strap to *nasesay,* then here on beach we land."

"Nine days? I've been out for nine days?"

Jerry shook his head. "Seventeen. Here we land eight days . . ." The Drac waved its hand behind itself.

"Ago . . . eight days ago."

"*Ae.*"

Seventeen days on Fyrine IV was better than a month on Earth. I opened my eyes again and looked at Jerry. The Drac was almost bubbling with excitement. "What about *tean*, your child?"

Jerry patted its swollen middle. "Good is, Davidge. You more *nasesay* hurt."

I overcame an urge to nod. "I'm happy for you." I closed my eyes and turned my face toward the wall, a combination of wood poles and leaves. "Jerry?"

"*Ess?*"

"You saved my life."

"*Ae.*"

"Why?"

Jerry sat quietly for a long time. "Davidge. On sandbar you talk. Loneliness now *gavey*." The Drac shook my arm. "Here, now you eat."

I turned and looked into a shell filled with a steaming liquid. "What is it; chicken soup?"

"*Ess?*"

"*Ess va?*" I pointed at the bowl, realizing for the first time how weak I was.

Jerry frowned. "Like slug, but long."

"An eel?"

"*Ae*, but eel on land, *gavey?*"

"You mean 'snake'?"

"Possiblemaybeperhaps."

I nodded and put my lips to the edge of the shell. I sipped some of the broth, swallowed and let the broth's healing warmth seep through my body. "Good."

"You *custa* want?"

"*Ess?*"

"*Custa.*" Jerry reached next to the fire and picked up a squareish chunk of clear rock. I looked at it, scrached it with my thumbnail, then touched it with my tongue.

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"Halite! Salt!"

Jerry smiled. "*Custa* you want?"

I laughed. "All the comforts. By all means, let's have *custa*."

Jerry took the halite, knocked off a corner with a small stone, then used the stone to grind the pieces against another stone. He held out the palm of his hand with a tiny mountain of white granules in the center. I took two pinches, dropped them into my snake soup and stirred it with my finger. Then I took a long swallow of the delicious broth. I smacked my lips. "Fantastic."

"Good, *ne*?"

"Better than good; fantastic." I took another swallow making a big show of smacking my lips and rolling my eyes.

"Fantastic, Davidge, *ne*?"

"*Ae*." I nodded at the Drac. "I think that's enough. I want to sleep."

"*Ae*, Davidge, *gavey*." Jerry took the bowl and put it beside the fire. The Drac stood, walked to the door and turned back. Its yellow eyes studied me for an instant, then it nodded, turned and went outside. I closed my eyes and let the heat from the campfire coax the sleep over me.

In two days I was up in the shack trying my legs, and in two more days, Jerry helped me outside. The shack was located at the top of a long, gentle rise in a scrub forest; none of the trees were any taller than five or six meters. At the bottom of the slope, better than eight kilometers from the shack, was the still-rolling sea. The Drac had carried me. Our trusty *nasesay* had filled with water and had been dragged back into the sea soon after Jerry pulled me to dry land. With it went the remainder of the ration bars. Dracs are very fussy about what they eat, but hunger finally drove Jerry to sample some of the local flora and fauna—hunger and the human lump that was rapidly drifting away from lack of nourishment. The Drac had settled on a bland, starchy type of root, a green bushberry that when dried made an acceptable tea, and snakemeat. Exploring, Jerry had found a partly eroded salt dome. In the days that followed, I grew stronger and added to our diet with several types of sea mollusk and a fruit resembling a cross between a pear and a plum.

As the days grew colder, the Drac and I were forced to realize that Fyrine IV had a winter. Given that, we had to face the possibility that the winter would be severe enough to prevent the gathering of food—and wood. When dried next to the fire, the ber-

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rybush and roots kept well, and we tried both salting and smoking snakemeat. With strips of fiber from the berrybush for thread, Jerry and I pieced together the snake skins for winter clothing. The design we settled on involved two layers of skins with the down from berrybush seed pods stuffed between and then held in place by quilting the layers.

We agreed that the house would never do. It took three days of searching to find our first cave, and another three days before we found one that suited us. The mouth opened onto a view of the eternally tormented sea, but was set in the face of a low cliff well above sea level. Around the cave's entrance we found great quantities of dead wood and loose stone. The wood we gathered for heat; and the stone we used to wall up the entrance, leaving only space enough for a hinged door. The hinges were made of snake leather and the door of wooden poles tied together with berrybush fibre. The first night after completing the door, the sea winds blew it to pieces; and we decided to go back to the original door design we had used on the sandbar.

Deep inside the cave, we made our living quarters in a chamber with a wide, sandy floor. Still deeper, the cave had natural pools of water, which were fine for drinking but too cold for bathing. We used the pool chamber for our supply room. We lined the walls of our living quarters with piles of wood and made new beds out of snakeskins and seed pod down. In the center of the chamber we built a respectable fireplace with a large, flat stone over the coals for a griddle. The first night we spent in our new home, I discovered that, for the first time since ditching on that damned planet, I couldn't hear the wind.

During the long nights, we would sit at the fireplace making things—gloves, hats, packbags—out of snake leather, and we would talk. To break the monotony, we alternated days between speaking Drac and English, and by the time the winter hit with its first ice storm, each of us was comfortable in the other's language.

We talked of Jerry's coming child:

"What are you going to name it, Jerry?"

"It already has a name. See, the Jeriba line has five names. My name is Shigan; before me came my parent, Gothig; before Gothig was Haesni; before Haesni was Ty, and before Ty was Zammis. The child is named Jeriba Zammis."

"Why only the five names? A human child can have just about any name its parents pick for it. In fact, once a human becomes

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an adult, he or she can pick any name he or she wants."

The Drac looked at me, its eyes filled with pity. "Davidge, how lost you must feel. You humans—how lost you must feel."

"Lost?"

Jerry nodded. "Where do you come from, Davidge?"

"You mean my parents?"

"Yes."

I shrugged. "I remember my parents."

"And their parents?"

"I remember my mother's father. When I was young we used to visit him."

"Davidge, what do you know about this grandparent?"

I rubbed my chin. "It's kind of vague . . . I think he was in some kind of agriculture—I don't know."

"And his parents?"

I shook my head. "The only thing I remember is that somewhere along the line, English and Germans figured. *Gavey* Germans and English?"

Jerry nodded. "Davidge, I can recite the history of my line back to the founding of my planet by Jeriba Ty, one of the original settlers, one hundred and ninety-nine generations ago. At our line's archives on Draco, there are the records that trace the line across space to the racehome planet, Sindie, and there back seventy generations to Jeriba Ty, the founder of the Jeriba line."

"How does one become a founder?"

"Only the firstborn carries the line. Products of second, third, or fourth births must found their own lines."

I nodded, impressed. "Why only the five names? Just to make it easier to remember them?"

Jerry shook its head. "No. The names are things to which we add distinction; they are the same, commonplace five so that they do not overshadow the events that distinguish their bearers. The name I carry, Shigan, has been served by great soldiers, scholars, students of philosophy, and several priests. The name my child will carry has been served by scientists, teachers, and explorers."

"You remember all of your ancestor's occupations?"

Jerry nodded. "Yes, and what they each did and where they did it. You must recite your line before the line's archives to be admitted into adulthood as I was twenty-two of my years ago. Zammis will do the same, except the child must begin its recitation . . ." Jerry smiled, "with my name, Jeriba Shigan."

"You can recite almost two hundred biographies from memory?"

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"Yes."

I went over to my bed and stretched out. As I stared up at the smoke being sucked through the crack in the chamber's ceiling, I began to understand what Jerry meant by feeling lost. A Drac with several dozens of generations under its belt knew who it was and what it had to live up to. "Jerry?"

"Yes, Davidge?"

"Will you recite them for me?" I turned my head and looked at the Drac in time to see an expression of utter surprise melt into joy. It was only after many years had passed that I learned I had done Jerry a great honor in requesting his line. Among the Dracs, it is a rare expression of respect, not only of the individual, but of the line.

Jerry placed the hat he was sewing on the sand, stood and began.

"Before you here I stand, Shigan of the line of Jeriba, born of Gothig, the teacher of music. A musician of high merit, the students of Gothig included Datzizh of the Nem line, Perravane of the Tuscor line, and many lesser musicians. Trained in music at the Shimuram, Gothig stood before the archives in the year 11,051 and spoke of its parent Haesni, the manufacturer of ships. . . ."

As I listened to Jerry's singsong of formal Dracon, the backward biographies—beginning with death and ending with adulthood—I experienced a sense of time-binding, of being able to know and touch the past. Battles, empires built and destroyed, discoveries made, great things done—a tour through twelve thousand years of history, but perceived as a well-defined, living continuum.

Against this: I Willis of the Davidge line stand before you, born of Sybil the housewife and Nathan the second-rate civil engineer, one of them born of Grandpop, who probably had something to do with agriculture, born of nobody in particular. . . . Hell, I wasn't even that! My older brother carried the line; not me. I listened and made up my mind to memorize the line of Jeriba.

We talked of war:

"That was a pretty neat trick, suckering me into the atmosphere, then ramming me."

Jerry shrugged. "Dracon fleet pilots are best; this is well known."

I raised my eyebrows. "That's why I shot your tail feathers off, huh?"

Jerry shrugged, frowned, and continued sewing on the scraps of

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snake leather. "Why do the Earthmen invade this part of the Galaxy, Davidge? We had thousands of years of peace before you came."

"Hah! Why do the Dracs invade? We were at peace, too. What are you doing here?"

"We settle these planets. It is the Drac tradition. We are explorers and founders."

"Well, toad face, what do you think we are, a bunch of homebodies? Humans have had space travel for less than two hundred years, but we've settled almost twice as many planets as the Dracs—"

Jerry held up a finger. "Exactly! You humans spread like a disease. Enough! We don't want you here!"

"Well, we're here, and here to stay. Now, what are you doing to do about it?"

"You see what we do, *Irkmaan*, we fight!"

"Phooey! You call that little scrap we were in a fight? Hell, Jerry, we were kicking you junk jocks out of the sky—"

"Haw, Davidge! That's why you sit here sucking on smoked snakemeat!"

I pulled the little rascal out of my mouth and pointed it at the Drac. "I notice your breath has a snake flavor too, Drac!"

Jerry snorted and turned away from the fire. I felt stupid, first because we weren't going to settle an argument that had plagued a hundred worlds for over a century. Second, I wanted to have Jerry check my recitation. I had over a hundred generations memorized. The Drac's side was toward the fire leaving enough light falling on its lap to see its sewing.

"Jerry, what are you working on?"

"We have nothing to talk about, Davidge."

"Come on, what is it?"

Jerry turned its head toward me, then looked back into its lap and picked up a tiny snakeskin suit. "For Zammis." Jerry smiled and I shook my head, then laughed.

We talked of philosophy:

"You studied Shizumaat, Jerry; why won't you tell me about its teachings?"

Jerry frowned. "No, Davidge."

"Are Shizumaat's teachings secret or something?"

Jerry shook its head. "No. But we honor Shizumaat too much for talk."

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I rubbed my chin. "Do you mean too much to talk about it, or to talk about it with a human?"

"Not with humans, Davidge; just not with you."

"Why?"

Jerry lifted its head and narrowed its yellow eyes. "You know what you said . . . on the sandbar."

I scratched my head and vaguely recalled the curse I laid on the Drac about Shizumaat eating it. I held out my hands. "But, Jerry, I was mad, angry. You can't hold me accountable for what I said then."

"I do."

"Will it change anything if I apologize?"

"Not a thing."

I stopped myself from saying something nasty and thought back to that moment when Jerry and I stood ready to strangle each other. I remembered something about that meeting and screwed the corners of my mouth in place to keep from smiling. "Will you tell me Shizumaat's teachings if I forgive you . . . for what you said about Mickey Mouse?" I bowed my head in an appearance of reverence, although its chief purpose was to suppress a cackle.

Jerry looked up at me, its face pained with guilt. "I have felt bad about that, Davidge. If you forgive me, I will talk about Shizumaat."

"Then, I forgive you, Jerry."

"One more thing."

"What?"

"You must tell me of the teachings of Mickey Mouse."

"I'll . . . uh, do my best."

We talked of Zammis:

"Jerry, what do you want little Zammy to be?"

The Drac shrugged. "Zammis must live up to its own name. I want it to do that with honor. If Zammis does that, it is all I can ask."

"Zammy will pick its own trade?"

"Yes."

"Isn't there anything special you want, though?"

Jerry nodded. "Yes, there is."

"What's that?"

"That Zammis will, one day, find itself off this miserable planet."

I nodded. "Amen."

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"Amen."

The winter dragged on until Jerry and I began wondering if we had gotten in on the beginning of an ice age. Outside the cave, everything was coated with a thick layer of ice, and the low temperature combined with the steady winds made venturing outside a temptation of death by falls or freezing. Still, by mutual agreement, we both went outside to relieve ourselves. There were several isolated chambers deep in the cave; but we feared polluting our water supply, not to mention the air inside the cave. The main risk outside was dropping one's drawers at a wind chill factor that froze breath vapor before it could be blown through the thin face muffs we had made out of our flight suits. We learned not to dawdle.

One morning, Jerry was outside answering the call, while I stayed by the fire mashing up dried roots with water for griddle cakes. I heard Jerry call from the mouth of the cave. "Davidge!"

"What?"

"Davidge, come quick!"

A ship! It had to be! I put the shell bowl on the sand, put on my hat and gloves, and ran through the passage. As I came close to the door, I untied the muff from around my neck and tied it over my mouth and nose to protect my lungs. Jerry, its head bundled in a similar manner, was looking through the door, waving me on. "What is it?"

Jerry stepped away from the door to let me through. "Come, look!"

Sunlight. Blue sky and sunlight. In the distance, over the sea, new clouds were piling up; but above us the sky was clear. Neither of us could look at the sun directly, but we turned our faces to it and felt the rays of Fyrine on our skins. The light glared and sparkled off the ice-covered rocks and trees. "Beautiful."

"Yes." Jerry grabbed my sleeve with a gloved hand. "Davidge, you know what this means?"

"What?"

"Signal fires at night. On a clear night, a large fire could be seen from orbit, *ne*?"

I looked at Jerry, then back at the sky. "I don't know. If the fire were big enough, and we get a clear night, and if anybody picks that moment to look . . ." I let my head hang down. "That's always supposing that there's someone in orbit up there to do the looking." I felt the pain begin in my fingers. "We better go back in."

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"Davidge, it's a chance!"

"What are we going to use for wood, Jerry?" I held out an arm toward the trees above and around the cave. "Everything that can burn has at least fifteen centimeters of ice on it."

"In the cave—"

"Our firewood?" I shook my head. "How long is this winter going to last? Can you be sure that we have enough wood to waste on signal fires?"

"It's a chance, Davidge. It's a chance!"

Our survival riding on a toss of the dice. I shrugged. "Why not?"

We spent the next few hours hauling a quarter of our carefully gathered firewood and dumping it outside the mouth of the cave. By the time we were finished and long before night came, the sky was again a solid blanket of grey. Several times each night, we would check the sky, waiting for stars to appear. During the days, we would frequently have to spend several hours beating the ice off the wood pile. Still, it gave both of us hope, until the wood in the cave ran out and we had to start borrowing from the signal pile.

That night, for the first time, the Drac looked absolutely defeated. Jerry sat at the fireplace, staring at the flames. Its hand reached inside its snakeskin jacket through the neck and pulled out a small golden cube suspended on a chain. Jerry held the cube clasped in both hands, shut its eyes and began mumbling in Drac. I watched from my bed until Jerry finished. The Drac sighed, nodded and replaced the object within its jacket.

"What's that thing?"

Jerry looked up at me, frowned, then touched the front of its jacket. "This? It is my *Talman*—what you call a Bible."

"A Bible is a book. You know, with pages that you read."

Jerry pulled the thing from its jacket, mumbled a phrase in Drac, then worked a small catch. Another gold cube dropped from the first and the Drac held it out to me. "Be very careful with it, Davidge."

I sat up, took the object and examined it in the light of the fire. Three hinged pieces of the golden metal formed the binding of a book two-and-a-half centimeters on an edge. I opened the book in the middle and looked over the double columns of dots, lines, and squiggles. "It's in Drac."

"Of course."

"But I can't read it."

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Jerry's eyebrows went up. "You speak Drac so well, I didn't remember . . . would you like me to teach you?"

"To read this?"

"Why not? You have an appointment you have to keep?"

I shrugged. "No." I touched my finger to the book and tried to turn one of the tiny pages. Perhaps fifty pages went at once. "I can't separate the pages."

Jerry pointed at a small bump at the top of the spine. "Pull out the pin. It's for turning the pages."

I pulled out the short needle, touched it against a page and it slid loose of its companion and flipped. "Who wrote your *Talman,* Jerry?"

"Many. All great teachers."

"Shizumaat?"

Jerry nodded. "Shizumaat is one of them."

I closed the book and held it in the palm of my hand. "Jerry, why did you bring this out now?"

"I needed its comfort." The Drac held out its arms. "This place. Maybe we will grow old here and die. Maybe we will never be found. I see this today as we brought in the signal fire wood." Jerry placed its hands on its belly. "Zammis will be born here. The *Talman* helps me to accept what I cannot change."

"Zammis; how much longer?"

Jerry smiled. "Soon."

I looked at the tiny book. "I would like you to teach me to read this, Jerry."

The Drac took the chain and case from around its neck and handed it to me. "You must keep the *Talman* in this."

I held it for a moment, then shook my head. "I can't keep this, Jerry. It's obviously of great value to you. What if I lost it?"

"You won't. Keep it while you learn. The student must do this."

I put the chain around my neck. "This is quite an honor you do me."

Jerry shrugged. "Much less than the honor you do me by memorizing the Jeriba line. Your recitations have been accurate, and moving." Jerry took some charcoal from the fire, stood and walked to the wall of the chamber. That night I learned the thirty-one letters and sounds of the Drac alphabet, as well as the additional nine sounds and letters used in formal Drac writings.

The wood eventually ran out. Jerry was very heavy and very, very sick as Zammis prepared to make its appearance, and it was

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all the Drac could do to waddle outside with my help to relieve itself. Hence, woodgathering, which involved taking our remaining stick and beating the ice off the dead standing trees, fell to me, as did cooking.

On a particularly blustery day, I noticed that the ice on the trees was thinner. Somewhere we had turned winter's corner and were heading for spring. I spent my ice-pounding time feeling great at the thought of spring, and I knew Jerry would pick up some at the news. The winter was really getting the Drac down. I was working the woods above the cave, taking armloads of gathered wood and dropping them down below, when I heard a scream. I froze, then looked around. I could see nothing but the sea and the ice around me. Then, the scream again. "Davidge!" It was Jerry. I dropped the load I was carrying and ran to the cleft in the cliff's face that served as a path to the upper woods. Jerry screamed again; and I slipped, then rolled until I came to the shelf level with the cave's mouth. I rushed through the entrance, down the passage way until I came to the chamber. Jerry writhed on its bed, digging its fingers into the sand.

I dropped on my knees next to the Drac. "I'm here, Jerry. What is it? What's wrong?"

"Davidge!" The Drac rolled its eyes, seeing nothing, its mouth worked silently, then exploded with another scream.

"Jerry, it's me!" I shook the Drac's shoulder. "It's me, Jerry. Davidge!"

Jerry turned its head toward me, grimaced, then clasped the fingers of one hand around my left wrist with the strength of pain. "Davidge! Zammis . . . something's gone wrong!"

"What? What can I do?"

Jerry screamed again, then its head fell back to the bed in a half-faint. The Drac fought back to consciousness and pulled my head down to its lips. "Davidge, you must swear."

"What, Jerry? Swear what?"

"Zammis . . . on Draco. To stand before the line's archives. Do this."

"What do you mean? You talk like you're dying."

"I am, Davidge. Zammis two hundredth generation . . . very important. Present my child, Davidge. Swear!"

I wiped the sweat from my face with my free hand. "You're not going to die, Jerry. Hang on!"

"Enough! Face truth, Davidge! I die! You must teach the line of Jeriba to Zammis . . . and the book, the *Talman, gavey*?"

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"Stop it!" Panic stood over me almost as a physical presence. "Stop talking like that! You aren't going to die, Jerry. Come on; fight, you *kizlode* sonofabitch. . . ."

Jerry screamed. Its breathing was weak and the Drac drifted in and out of consciousness. "Davidge."

"What?" I realized I was sobbing like a kid.

"Davidge, you must help Zammis come out."

"What . . . how? What in the Hell are you talking about?"

Jerry turned its face to the wall of the cave. "Lift my jacket."

"What?"

"Lift my jacket, Davidge. Now!"

I pulled up the snake skin jacket exposing Jerry's swollen belly. The fold down the center was bright red and seeping a clear liquid. "What . . . what should I do?"

Jerry breathed rapidly, then held its breath. "Tear it open! You must tear it open, Davidge!"

"No!"

"Do it! Do it, or Zammis dies!"

"What do I care about your goddamn child, Jerry? What do I have to do to save you?"

"Tear it open . . ." whispered the Drac. "Take care of my child, *Irkmaan*. Present Zammis before the Jeriba archives. Swear this to me."

"Oh, Jerry . . ."

"Swear this!"

I nodded, hot fat tears dribbling down my cheeks. "I swear it. . . ." Jerry relaxed its grip on my wrist and closed its eyes. I knelt next to the Drac, stunned. "No. No, no, no, no."

Tear it open! You must tear it open, Davidge!

I reached up a hand and gingerly touched the fold on Jerry's belly. I could feel life struggling beneath it, trying to escape the airless confines of the Drac's womb. I hated it; I hated the damned thing as I never hated anything before. Its struggles grew weaker, then stopped.

Present Zammis before the Jeriba archives. Swear this to me. . . .

I swear it. . . .

I lifted my other hand and inserted my thumbs into the fold and tugged gently. I increased the amount of force, then tore at Jerry's belly like a madman. The fold burst open, soaking the front of my jacket with the clear fluid. Holding the fold open, I could see the still form of Zammis huddled in a well of the fluid,

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motionless.

I vomited. When I had nothing more to throw up, I reached into the fluid and put my hands under the Drac infant. I lifted it, wiped my mouth on my upper left sleeve, and closed my mouth over Zammis's and pulled the child's mouth open with my right hand. Three times, four times, I inflated the child's lungs, then it coughed. Then it cried. I tied off the two umbilicals with berry-bush fibre, then cut them. Jeriba Zammis was freed of the dead flesh of its parent.

I held the rock over my head, then brought it down with all of my force upon the ice. Shards splashed away from the point of impact, exposing the dark green beneath. Again, I lifted the rock and brought it down, knocking loose another rock. I picked it up, stood and carried it to the half-covered corpse of the Drac. "The Drac," I whispered. *Good. Just call it 'the Drac.' Toadface. Dragger.*

The enemy. Call it anything to insulate those feelings against the pain.

I looked at the pile of rocks I had gathered, decided it was sufficient to finish the job, then knelt next to the grave. As I placed the rocks on the pile, unmindful of the gale-blown sleet freezing on my snakeskins, I fought back the tears. I smacked my hands together to help restore the circulation. Spring was coming, but it was still dangerous to stay outside too long. And I had been a long time building the Drac's grave. I picked up another rock and placed it into position. As the rock's weight leaned against the snakeskin mattress cover, I realized that the Drac was already frozen. I quickly placed the remainder of the rocks, then stood.

The wind rocked me and I almost lost my footing on the ice next to the grave. I looked toward the boiling sea, pulled my snakeskins around myself more tightly, then looked down at the pile of rocks. *There should be words. You don't just cover up the dead, then go to dinner. There should be words.* But what words? I was no religionist, and neither was the Drac. Its formal philosophy on the matter of death was the same as my informal rejection of Islamic delights, pagan Valhallas, and Judeo-Christian pies in the sky. Death is death; *finis*; the end; the worms crawl in, the worms crawl out . . . *Still, there should be words.*

I reached beneath my snakeskins and clasped my gloved hand around the golden cube of the *Talman*. I felt the sharp corners of

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the cube through my glove, closed my eyes and ran through the words of the great Drac philosophers. But there was nothing they had written for this moment.

The *Talman* was a book on life. *Talma* means life, and this occupies Drac philosophy. They spare nothing for death. Death is a fact; the end of life. The *Talman* had no words for me to say. The wind knifed through me, causing me to shiver. Already my fingers were numb and pains were beginning in my feet. Still, there should be words. But the only words I could think of would open the gate, flooding my being with pain—with the realization that the Drac was gone. *Still . . . still, there should be words.*

"Jerry, I . . ." I had no words. I turned from the grave, my tears mixing with the sleet.

With the warmth and silence of the cave around me, I sat on my mattress, my back against the wall of the cave. I tried to lose myself in the shadows and flickers of light cast on the opposite wall by the fire. Images would half-form, then dance away before I could move my mind to see something in them. As a child I used to watch clouds, and in them, see faces, castles, animals, dragons, and giants. It was a world of escape—fantasy; something to inject wonder and adventure into the mundane, regulated life of a middle-class boy leading a middle-class life. All I could see on the wall of the cave was a representation of Hell: flames licking at twisted, grotesque representations of condemned souls. I laughed at the thought. We think of Hell as fire, supervised by a cackling sadist in a red union suit. Fyrine IV had taught me this much: Hell is loneliness, hunger, and endless cold.

I heard a whimper, and I looked into the shadows toward the small mattress at the back of the cave. Jerry had made the snakeskin sack filled with seed pod down for Zammis. It whimpered again, and I leaned forward, wondering if there was something it needed. A pang of fear tickled my guts. What does a Drac infant eat? Dracs aren't mammals. All they ever taught us in training was how to recognize Dracs—that, and how to kill them. Then real fear began working on me. "What in the hell am I going to use for diapers?"

It whimpered again. I pushed myself to my feet, walked the sandy floor to the infant's side, then knelt beside it. Out of the bundle that was Jerry's old flight suit, two chubby three-fingered arms waved. I picked up the bundle, carried it next to the fire, and sat on a rock. Balancing the bundle on my lap, I carefully

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unwrapped it. I could see the yellow glitter of Zammis's eyes beneath yellow, sleep-heavy lids. From the almost noseless face and solid teeth to its deep yellow color, Zammis was every bit a miniature of Jerry, except for the fat. Zammis fairly wallowed in rolls of fat. I looked, and was grateful to find that there was no mess.

I looked into Zammis' face. "You want something to eat?"

"Guh."

Its jaws were ready for business, and I assumed that Dracs must chew solid food from day one. I reached over the fire and picked up a twist of dried snake, then touched it against the infant's lips. Zammis turned its head. "C'mon, eat. You're not going to find anything better around here."

I pushed the snake against its lips again, and Zammis pulled back a chubby arm and pushed it away. I shrugged. "Well, whenever you get hungry enough, it's there."

"Guh meh!" Its head rocked back and forth on my lap, a tiny, three-fingered hand closed around my finger, and it whimpered again.

"You don't want to eat, you don't need to be cleaned up, so what do you want? *Kos va nu?*"

Zammis's face wrinkled, and its hand pulled at my finger. Its other hand waved in the direction of my chest. I picked Zammis up to arrange the flight suit, and the tiny hands reached out, grasped the front of my snakeskins, and held on as the chubby arms pulled the child next to my chest. I held it close, it placed its cheek against my chest, and promptly fell asleep. "Well . . . I'll be damned."

Until the Drac was gone, I never realized how closely I had stood near the edge of madness. My loneliness was a cancer—a growth that I fed with hate: hate for the planet with its endless cold, endless winds, and endless isolation; hate for the helpless yellow child with its clawing need for care, food, and an affection that I couldn't give; and hate for myself. I found myself doing things that frightened and disgusted me. To break my solid wall of being alone, I would talk, shout, and sing to myself—uttering curses, nonsense, or meaningless croaks.

Its eyes were open, and it waved a chubby arm and cooed. I picked up a large rock, staggered over to the child's side, and held the weight over the tiny body. "I could drop this thing, kid. Where would you be then?" I felt laughter coming from my lips. I threw the rock aside. "Why should I mess up the cave? Outside. Put you

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outside for a minute, and you die! You hear me? Die!"

The child worked its three-fingered hands at the empty air, shut its eyes, and cried. "Why don't you eat? Why don't you crap? Why don't you do anything right, but cry?" The child cried more loudly. "Bah! I ought to pick up that rock and finish it! That's what I ought . . . " A wave of revulsion stopped my words, and I went to my mattress, picked up my cap, gloves, and muff, then headed outside.

Before I came to the rocked-in entrance to the cave, I felt the bite of the wind. Outside I stopped and looked at the sea and sky—a roiling panorama in glorious black and white, grey and grey. A gust of wind slapped against me, rocking me back toward the entrance. I regained my balance, walked to the edge of the cliff and shook my fist at the sea. "Go ahead! Go ahead and blow, you *kizlode* sonofabitch! You haven't killed me yet!"

I squeezed the windburned lids of my eyes shut, then opened them and looked down. A forty-meter drop to the next ledge, but if I took a running jump, I could clear it. Then it would be a hundred and fifty meters to the rocks below. *Jump*. I backed away from the cliff's edge. "Jump! Sure, jump!" I shook my head at the sea. "I'm not going to do your job for you! You want me dead, you're going to have to do it yourself!"

I looked back and up, above the entrance to the cave. The sky was darkening and in a few hours, night would shroud the landscape. I turned toward the cleft in the rock that led to the scrub forest above the cave.

I squatted next to the Drac's grave and studied the rocks I had placed there, already fused together with a layer of ice. "Jerry. What am I going to do?"

The Drac would sit by the fire, both of us sewing. And we talked.

"You know, Jerry, all this," I held up the Talman, *"I've heard it all before. I expected something different."*

The Drac lowered its sewing to its lap and studied me for an instant. Then it shook its head and resumed its sewing. "You are not a terribly profound creature, Davidge."

"What's that supposed to mean?"

Jerry held out a three-fingered hand. "A universe, Davidge—there is a universe out there, a universe of life, objects, and events. There are differences, but it is all the same universe, and we all must obey the same universal laws. Did you ever think of that?"

"No."

"That is what I mean, Davidge. Not terribly profound."

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I snorted. "I told you, I'd heard this stuff before. So I imagine that shows humans to be just as profound as Dracs."

Jerry laughed. "You always insist on making something racial out of my observations. What I said applied to you, not to the race of humans. . . ."

I spat on the frozen ground. "You Dracs think you're so damned smart." The wind picked up, and I could taste the sea salt in it. One of the big blows was coming. The sky was changing to that curious darkness that tricked me into thinking it was midnight blue, rather than black. A trickle of ice found its way under my collar.

"What's wrong with me just being me? Everybody in the universe doesn't have to be a damned philosopher, toadface!" There were millions—billions—like me. More maybe. "What difference does it make to anything whether I ponder existence or not? It's here; that's all I have to know."

"Davidge, you don't even know your family line beyond your parents, and now you say you refuse to know that of your universe that you can know. How will you know your place in this existence, Davidge? Where are you? Who are you?"

I shook my head and stared at the grave, then I turned and faced the sea. In another hour, or less, it would be too dark to see the whitecaps. "I'm me, that's who." But was that 'me' who held the rock over Zammis, threatening a helpless infant with death? I felt my guts curdle as the loneliness I thought I felt grew claws and fangs and began gnawing and slashing at the remains of my sanity. I turned back to the grave, closed my eyes, then opened them. "I'm a fighter pilot, Jerry. Isn't that something?"

"That is what you do, Davidge; that is not who nor what you are."

I knelt next to the grave and clawed at the ice-sheathed rocks with my hands. "You don't talk to me now, Drac! *You're dead!*" I stopped, realizing that the words I had heard were from the *Talman*, processed into my own context. I slumped against the rocks, felt the wind, then pushed myself to my feet. "Jerry, Zammis won't eat. It's been three days. What do I do? Why didn't you tell me anything about Drac brats before you . . . " I held my hands to my face. "Steady, boy. Keep it up, and they'll stick you in a home." The wind pressed against my back, I lowered my hands, then walked from the grave.

I sat in the cave, staring at the fire. I couldn't hear the wind

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through the rock, and the wood was dry, making the fire hot and quiet. I tapped my fingers against my knees, then began humming. Noise, any kind, helped to drive off the oppressive loneliness. "Sonofabitch." I laughed and nodded. "Yea, verily, and *kizlode va nu, dutschaat.*" I chuckled, trying to think of all the curses and obscenities in Drac that I had learned from Jerry. There were quite a few. My toe tapped against the sand and my humming started up again. I stopped, frowned, then remembered the song.

"Highty tighty Christ almighty,
Who the Hell are we?
Zim zam, Gawd Damn,
We're in Squadron B."

I leaned back against the wall of the cave, trying to remember another verse. *A pilot's got a rotten life/ no crumpets with our tea/ we have to service the general's wife/ and pick fleas from her knee.* "Damn!" I slapped my knee, trying to see the faces of the other pilots in the squadron lounge. I could almost feel the whiskey fumes tickling the inside of my nose. Vadik, Wooster, Arnold . . . the one with the broken nose—Demerest, Kadiz. I hummed again, swinging an imaginary mug of issue grog by its imaginary handle.

"And, if he doesn't like it,
I'll tell you what we'll do:
We'll fill his ass with broken glass,
and seal it up with glue."

The cave echoed with the song. I stood, threw up my arms and screamed. "Yaaaaahoooooo!"

Zammis began crying. I bit my lip and walked over to the bundle on the mattress. "Well? You ready to eat?"

"Unh, unh, weh." The infant rocked its head back and forth. I went to the fire, picked up a twist of snake, then returned. I knelt next to Zammis and held the snake to its lips. Again, the child pushed it away. "Come on, you. You have to eat." I tried again with the same results. I took the wraps off the child and looked at its body. I could tell it was losing weight, although Zammis didn't appear to be getting weak. I shrugged, wrapped it up again, stood, and began walking back to my mattress.

"Guh, weh."

I turned. "What?"

"Ah, guh, guh."

I went back, stooped over and picked the child up. Its eyes were open and it looked into my face, then smiled.

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"What're you laughing at, ugly? You should get a load of your own face."

Zammis barked out a short laugh, then gurgled. I went to my mattress, sat down, and arranged Zammis in my lap. "Gumma, buh, buh." Its hand grabbed a loose flap of snakeskin on my shirt and pulled on it.

"Gumma buh buh to you, too. So, what do we do now? How about I start teaching you the line of Jeriban? You're going to have to learn it sometime, and it might as well be now." The Jeriban line. My recitations of the line were the only things Jerry ever complimented me about. I looked into Zammis's eyes. "When I bring you to stand before the Jeriba archives, you will say this: 'Before you here I stand, Zammis of the line of Jeriba, born of Shigan, the fighter pilot.' " I smiled, thinking of the upraised yellow brows if Zammis continued: *"and, by damn, Shigan was a Helluva good pilot, too. Why, I was once told he took a smart round in his tail feathers, then pulled around and rammed the* kizlode *sonofabitch, known to one and all as Willis E. Davidge . . ."* I shook my head. "You're not going to get your wings by doing the line in English, Zammis." I began again:

"Naatha nu enta va, Zammis zea does Jeriba, estay va Shigan, asaam naa denvadar. . . ."

For eight of those long days and nights, I feared the child would die. I tried everything—roots, dried berries, dried plumfruit, snakemeat dried, boiled, chewed, and ground. Zammis refused it all. I checked frequently, but each time I looked through the child's wraps, they were as clean as when I had put them on. Zammis lost weight, but seemed to grow stronger. By the ninth day it was crawling the floor of the cave. Even with the fire, the cave wasn't really warm. I feared that the kid would get sick crawling around naked, and I dressed it in the tiny snakeskin suit and cap Jerry had made for it. After dressing it, I stood Zammis up and looked at it. The kid had already developed a smile full of mischief that, combined with the twinkle in its yellow eyes and its suit and cap, made it look like an elf. I was holding Zammis up in a standing position. The kid seemed pretty steady on its legs, and I let go. Zammis smiled, waved its thinning arms about, then laughed and took a faltering step toward me. I caught it as it fell, and the little Drac squealed.

In two more days Zammis was walking and getting into everything that could be gotten into. I spent many an anxious moment

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searching the chambers at the back of the cave for the kid after coming in from outside. Finally, when I caught him at the mouth of the cave heading full steam for the outside, I had had enough. I made a harness out of snakeskin, attached it to a snake-leather leash, and tied the other end to a projection of rock above my head. Zammis still got into everything, but at least I could find it.

Four days after it learned to walk, it wanted to eat. Drac babies are probably the most convenient and considerate infants in the universe. They live off their fat for about three or four Earth weeks, and don't make a mess the entire time. After they learn to walk, and can therefore make it to a mutually agreed upon spot, then they want food and begin discharging wastes. I showed the kid once how to use the litter box I had made, and never had to again. After five or six lessons, Zammis was handling its own drawers. Watching the little Drac learn and grow, I began to understand those pilots in my squadron who used to bore each other—and everyone else—with countless pictures of ugly children, accompanied by thirty-minute narratives for each snapshot. Before the ice melted, Zammis was talking. I taught it to call me "Uncle."

For lack of a better term, I called the ice-melting season "spring." It would be a long time before the scrub forest showed any green or the snakes ventured forth from their icy holes. The sky maintained its eternal cover of dark, angry clouds, and still the sleet would come and coat everything with a hard, slippery glaze. But the next day the glaze would melt, and the warmer air would push another millimeter into the soil.

I realized that this was the time to be gathering wood. Before the winter hit, Jerry and I working together hadn't gathered enough wood. The short summer would have to be spent putting up food for the next winter. I was hoping to build a tighter door over the mouth of the cave, and I swore that I would figure out some kind of indoor plumbing. Dropping your drawers outside in the middle of winter was dangerous. My mind was full of these things as I stretched out on my mattress watching the smoke curl through a crack in the roof of the cave. Zammis was off in the back of the cave playing with some rocks that it had found, and I must have fallen asleep. I awoke with the kid shaking my arm.

"Uncle?"

"Huh? Zammis?"

"Uncle. Look."

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I rolled over on my left side and faced the Drac. Zammis was holding up his right hand, fingers spread out. "What is it, Zammis?"

"Look." It pointed at each of its three fingers in turn. "One, two, three."

"So?"

"Look." Zammis grabbed my right hand and spread out the fingers. "One, two, three, *four, five*!"

I nodded. "So you can count to five."

The Drac frowned and made an impatient gesture with its tiny fists. "Look." It took my outstretched hand and placed its own on top of it. With its other hand, Zammis pointed first at one of its own fingers, then at one of mine. "One, one." The child's yellow eyes studied me to see if I understood.

"Yes."

The child pointed again. "Two, two." It looked at me, then looked back at my hand and pointed. "Three, three." Then he grabbed my two remaining fingers. *"Four, Five!"* It dropped my hand, then pointed to the side of its own hand. "Four, five?"

I shook my head. Zammis, at less than four Earth months old, had detected part of the difference between Dracs and humans. A human child would be—what—five, six, or seven years old before asking questions like that. I sighed. "Zammis."

"Yes, Uncle?"

"Zammis, you are a Drac. Dracs only have three fingers on a hand." I held up my right hand and wiggled the fingers. "I'm a human. I have five."

I swear that tears welled in the child's eyes. Zammis held out its hands, looked at them, then shook its head. "Grow four, five?"

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I sat up and faced the kid. Zammis was wondering where its other four fingers had gone. "Look, Zammis. You and I are different . . . different kinds of beings, understand?"

Zammis shook his head. "Grow four, five?"

"You won't. You're a Drac." I pointed at my chest. "I'm a human." This was getting me nowhere. "Your parent, where you came from, was a Drac. Do you understand?"

Zammis frowned. "Drac. What Drac?"

The urge to resort to the timeless standby of "you'll understand when you get older" pounded at the back of my mind. I shook my head. "Dracs have three fingers on each hand. Your parent had three fingers on each hand." I rubbed my beard. "My parent was a human and had five fingers on each hand. That's why I have five fingers on each hand."

Zammis knelt on the sand and studied its fingers. It looked up at me, back to its hands, then back to me. "What parent?"

I studied the kid. It must be having an identity crisis of some kind. I was the only person it had ever seen, and I had five fingers per hand. "A parent is . . . the thing . . . " I scratched my beard again. "Look . . . we all come from someplace. I had a mother and father—two different kinds of humans—that gave me life; that made me, understand?"

Zammis gave me a look that could be interpreted as "Mac, you are full of it." I shrugged. "I don't know if I can explain it."

Zammis pointed at its own chest. "My mother? My father?"

I held out my hands, dropped them into my lap, pursed my lips, scratched my beard, and generally stalled for time. Zammis held an unblinking gaze on me the entire time. "Look, Zammis. You don't have a mother and a father. I'm a human, so I have them; you're a Drac. You have a parent—just one, see?"

Zammis shook its head. It looked at me, then pointed at its own chest. "Drac."

"Right."

Zammis pointed at my chest. "Human."

"Right again."

Zammis removed its hand and dropped it in its lap. "Where Drac come from?"

Sweet Jesus! Trying to explain hermaphroditic reproduction to a kid who shouldn't even be crawling yet! "Zammis . . . " I held up my hands, then dropped them into my lap. "Look. You see how much bigger I am than you?"

"Yes, Uncle."

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"Good." I ran my fingers through my hair, fighting for time and inspiration. "Your parent was big, like me. Its name was . . . Jeriba Shigan." Funny how just saying the name was painful. "Jeriba Shigan was like you. It only had three fingers on each hand. It grew you in its tummy." I poked Zammis's middle. "Understand?"

Zammis giggled and held its hands over its stomach. "Uncle, how Dracs grow there?"

I lifted my legs onto the mattress and stretched out. Where do little Dracs come from? I looked over to Zammis and saw the child hanging upon my every word. I grimaced and told the truth. "Damned if I know, Zammis. Damned if I know." Thirty seconds later, Zammis was back playing with its rocks.

Summer, and I taught Zammis how to capture and skin the long grey snakes, and then how to smoke the meat. The child would squat on the shallow bank above a mudpool, its yellow eyes fixed on the snake holes in the bank, waiting for one of the occupants to poke out its head. The wind would blow, but Zammis wouldn't move. Then a flat, triangular head set with tiny blue eyes would appear. The snake would check the pool, turn and check the bank, then check the sky. It would advance out of the hole a bit, then check it all again. Often the snakes would look directly at Zammis, but the Drac could have been carved from rock. Zammis wouldn't move until the snake was too far out of the hole to pull itself back in tail first. Then Zammis would strike, grabbing the snake with both hands just behind the head. The snakes had no fangs and weren't poisonous, but they were lively enough to toss Zammis into the mudpool on occasion.

The skins were spread and wrapped around tree trunks and pegged in place to dry. The tree trunks were kept in an open place near the entrance to the cave, but under an overhang that faced away from the ocean. About two thirds of the skins put up in this manner cured; the remaining third would rot.

Beyond the skin room was the smokehouse: a rock-walled chamber that we would hang with rows of snakemeat. A greenwood fire would be set in a pit in the chamber's floor, then we would fill in the small opening with rocks and dirt.

"Uncle, why doesn't the meat rot after it's smoked?"

I thought upon it. "I'm not sure; I just know it doesn't."

"Why do you know?"

I shrugged. "I just do. I read about it, probably."

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"What's read?"

"Reading. Like when I sit down and read the *Talman*."

"Does the *Talman* say why the meat doesn't rot?"

"No. I meant that I probably read it in another book."

"Do we have more books?"

I shook my head. "I meant before I came to this planet."

"Why did you come to this planet?"

"I told you. Your parent and I were stranded here during the battle."

"Why do the humans and Dracs fight?"

"It's very complicated." I waved my hands about for a bit. The human line was that the Dracs were aggressors invading our space. The Drac line was that the humans were aggressors invading their space. The truth? "Zammis, it has to do with the colonization of new planets. Both races are expanding and both races have a tradition of exploring and colonizing new planets. I guess we just expanded into each other. Understand?"

Zammis nodded, then became mercifully silent as it fell into deep thought. The main thing I learned from the Drac child was all of the questions I didn't have answers to. I was feeling very smug, however, at having gotten Zammis to understand about the war, thereby avoiding my ignorance on the subject of preserving meat. "Uncle?"

"Yes, Zammis?"

"What's a planet?"

As the cold, wet summer came to an end, we had the cave jammed with firewood and preserved food. With that out of the way, I concentrated my efforts on making some kind of indoor plumbing out of the natural pools in the chambers deep within the cave. The bathtub was no problem. By dropping heated rocks into one of the pools, the water could be brought up to a bearable—even comfortable—temperature. After bathing, the hollow stems of a bamboo-like plant could be used to siphon out the dirty water. The tub could then be refilled from the pool above. The problem was where to siphon the water. Several of the chambers had holes in their floors. The first three holes we tried drained into our main chamber, wetting the low edge near the entrance. The previous winter, Jerry and I had considered using one of those holes for a toilet that we would flush with water from the pools. Since we didn't know where the goodies would come out, we decided against it.

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The fourth hole Zammis and I tried drained out below the entrance to the cave in the face of the cliff. Not ideal, but better than answering the call of nature in the middle of a combination ice-storm and blizzard. We rigged up the hole as a drain for both the tub and toilet. As Zammis and I prepared to enjoy our first hot bath, I removed my snakeskins, tested the water with my toe, then stepped in. "Great!" I turned to Zammis, the child still half dressed. "Come on in, Zammis. The water's fine." Zammis was staring at me, its mouth hanging open. "What's the matter?"

The child stared wide-eyed, then pointed at me with a three-fingered hand. "Uncle . . . what's that?"

I looked down. "Oh." I shook my head, then looked up at the child. "Zammis, I explained all that, remember? I'm a human."

"But what's it *for*?"

I sat down in the warm water, removing the object of discussion from sight. "It's for the elimination of liquid wastes . . . among other things. Now, hop in and get washed."

Zammis shucked its snakeskins, looked down at its own smooth-surfaced, combined system, then climbed into the tub. The child settled into the water up to its neck, its yellow eyes studying me. "Uncle?"

"Yes?"

"What *other things*?"

Well, I told Zammis. For the first time, the Drac appeared to be trying to decide whether my response was truthful or not, rather than its usual acceptance of my every assertion. In fact, I was convinced that Zammis thought I was lying—probably because I was.

Winter began with a sprinkle of snowflakes carried on a gentle breeze. I took Zammis above the cave to the scrub forest. I held the child's hand as we stood before the pile of rocks that served as Jerry's grave. Zammis pulled its snakeskins against the wind, bowed its head, then turned and looked up into my face. "Uncle, this is the grave of my parent?"

I nodded. "Yes."

Zammis turned back to the grave, then shook its head. "Uncle, how should I feel?"

"I don't understand, Zammis."

The child nodded at the grave. "I can see that you are sad being here. I think you want me to feel the same. Do you?"

I frowned, then shook my head. "No. I don't want you to be sad.

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I just wanted you to know where it is."

"May I go now?"

"Sure. Are you certain you know the way back to the cave?"

"Yes. I just want to make sure my soap doesn't burn again."

I watched as the child turned and scurried off into the naked trees, then I turned back to the grave. "Well, Jerry, what do you think of your kid? Zammis was using wood ashes to clean the grease off the shells, then it put a shell back on the fire and put water in it to boil off the burnt-on food. Fat and ashes. The next thing, Jerry, we were making soap. Zammis' first batch almost took the hide off us, but the kid's getting better . . . "

I looked up at the clouds, then brought my glance down to the sea. In the distance, low, dark clouds were building up. "See that? You know what that means, don't you? Ice-storm number one." The wind picked up and I squatted next to the grave to replace a rock that had rolled from the pile. "Zammis is a good kid, Jerry. I wanted to hate it . . . after you died. I wanted to hate it." I replaced the rock, then looked back toward the sea.

"I don't know how we're going to make it off planet, Jerry—" I caught a flash of movement out of the corner of my vision. I turned to the right and looked over the tops of the trees. Against the grey sky, a black speck streaked away. I followed it with my eyes until it went above the clouds.

I listened, hoping to hear an exhaust roar, but my heart was pounding so hard, all I could hear was the wind. Was it a ship? I stood, took a few steps in the direction the speck was going, then stopped. Turning my head, I saw that the rocks on Jerry's grave were already capped with thin layers of fine snow. I shrugged and headed for the cave. "Probably just a bird."

Zammis sat on its mattress, stabbing several pieces of snakeskin with a bone needle. I stretched out on my own mattress and watched the smoke curl up toward the crack in the ceiling. Was it a bird? Or was it a ship? Damn, but it worked on me. Escape from the planet had been out of my thoughts, had been buried, hidden for all that summer. But again, it twisted at me. To walk where a sun shined, to wear cloth again, experience central heating, eat food prepared by a chef, to be among . . . people again.

I rolled over on my right side and stared at the wall next to my mattress. People. Human people. I closed my eyes and swallowed. Girl human people. Female persons. Images drifted before my eyes—faces, bodies, laughing couples, the dance after flight train-

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ing . . . what was her name? Dolora? Dora?

I shook my head, rolled over and sat up, facing the fire. Why did I have to see whatever it was? All those things I had been able to bury—to forget—boiling over.

"Uncle?"

I looked up at Zammis. Yellow skin, yellow eyes, noseless toad-face. I shook my head. "What?"

"Is something wrong?"

Is something wrong, hah. "No. I just thought I saw something today. It probably wasn't anything." I reached to the fire and took a piece of dried snake from the griddle. I blew on it, then gnawed on the stringy strip.

"What did it look like?"

"I don't know. The way it moved, I thought it might be a ship. It went away so fast, I couldn't be sure. Might have been a bird."

"Bird?"

I studied Zammis. It'd never seen a bird; neither had I on Fyrine IV. "An animal that flies."

Zammis nodded. "Uncle, when we were gathering wood up in the scrub forest, I saw something fly."

"What? Why didn't you tell me?"

"I meant to, but I forgot."

"Forgot!" I frowned. "In which direction was it going?"

Zammis pointed to the back of the cave. "That way. Away from the sea." Zammis put down its sewing. "Can we go see where it went?"

I shook my head. "The winter is just beginning. You don't know what it's like. We'd die in only a few days."

Zammis went back to poking holes in the snakeskin. To make the trek in the winter would kill us. But spring would be something else. We could survive with double layered snakeskins stuffed with seed pod down, and a tent. We had to have a tent. Zammis and I could spend the winter making it, and packs. Boots. We'd need sturdy walking boots. Have to think on that. . . .

It's strange how a spark of hope can ignite, and spread, until all desperation is consumed. Was it a ship? I didn't know. If it was, was it taking off, or landing? I didn't know. If it was taking off, we'd be heading in the wrong direction. But the opposite direction meant crossing the sea. Whatever. Come spring we would head beyond the scrub forest and see what was there.

The winter seemed to pass quickly, with Zammis occupied with

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the tent and my time devoted to rediscovering the art of boot making. I made tracings of both of our feet on snakeskin, and, after some experimentation, I found that boiling the snake leather with plumfruit made it soft and gummy. By taking several of the gummy layers, weighting them, then setting them aside to dry, the result was a tough, flexible sole. By the time I finished Zammis's boots, the Drac needed a new pair.

"They're too small, Uncle."

"Waddaya mean, too small?"

Zammis pointed down. "They hurt. My toes are all crippled up."

I squatted down and felt the tops over the child's toes. "I don't understand. It's only been twenty, twenty-five days since I made the tracings. You sure you didn't move when I made them?"

Zammis shook its head. "I didn't move."

I frowned, then stood. "Stand up, Zammis." The Drac stood and I moved next to it. The top of Zammis's head came to the middle of my chest. Another sixty centimeters and it'd be as tall as Jerry. "Take them off, Zammis. I'll make a bigger pair. Try not to grow so fast."

Zammis pitched the tent inside the cave, put glowing coals inside, then rubbed fat into the leather for waterproofing. It had grown taller, and I had held off making the Drac's boots until I could be sure of the size it would need. I tried to do a projection by measuring Zammis's feet every ten days, then extending the curve into spring. According to my figures, the kid would have feet resembling a pair of attack transports by the time the snow melted. By spring, Zammis would be full grown. Jerry's old flight boots had fallen apart before Zammis had been born, but I had saved the pieces. I used the soles to make my tracings and hoped for the best.

I was busy with the new boots and Zammis was keeping an eye on the tent treatment. The Drac looked back at me.

"Uncle?"

"What?"

"Existence is the first given?"

I shrugged. "That's what Shizumaat says; I'll buy it."

"But, Uncle, how do we *know* that existence is real?"

I lowered my work, looked at Zammis, shook my head, then resumed stitching the boots. "Take my word for it."

The Drac grimaced. "But, Uncle, that is not knowledge; that is faith."

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I sighed, thinking back to my sophomore year at the University of Nations—a bunch of adolescents lounging around a cheap flat experimenting with booze, powders, and philosophy. At a little more than one Earth year old, Zammis was developing into an intellectual bore. "So, what's wrong with faith?"

Zammis snickered. "Come now, Uncle. *Faith*?"

"It helps some of us along this drizzle-soaked coil."

"Coil?"

I scratched my head. "This mortal coil; life. Shakespeare, I think."

Zammis frowned. "It is not in the *Talman*."

"He, not it. Shakespeare was a human."

Zammis stood, walked to the fire and sat across from me. "Was he a philosopher, like Mistan or Shizumaat?"

"No. He wrote plays—like stories, acted out."

Zammis rubbed its chin. "Do you remember any of Shakespeare?"

I held up a finger. " 'To be, or not to be; that is the question.' "

The Drac's mouth dropped open, then it nodded its head. "Yes. Yes! To be or not to be; that *is* the question!" Zammis held out its hands. "How do we *know* the wind blows outside the cave when we are not there to see it? Does the sea still boil if we are not there to feel it?"

I nodded. "Yes."

"But, Uncle, how do we *know*?"

I squinted at the Drac. "Zammis, I have a question for you. Is the following statement true or false: What I am saying right now is false."

Zammis blinked. "If it is false, then the statement is true. But . . . if it's true . . . the statement is false, but . . . " Zammis blinked again, then turned and went back to rubbing fat into the tent. "I'll think upon it, Uncle."

"You do that, Zammis."

The Drac thought upon it for about ten minutes, then turned back. "The statement is false."

I smiled. "But that's what the statement said; hence it is true, but . . . " I let the puzzle trail off. Oh, smugness, thou temptest even saints.

"No, Uncle. The statement is meaningless in its present context." I shrugged. "You see, Uncle, the statement assumes the existence of truth values that can comment upon themselves devoid of any other reference. I think Lurrvena's logic in the *Talman* is

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clear on this, and if meaninglessness is equated with falsehood . . . "

I sighed. "Yeah, well—"

"You see, Uncle, you must, first, establish a context in which your statement has meaning."

I leaned forward, frowned, and scratched my beard. "I see. You mean I was putting Descartes before the horse?"

Zammis looked at me strangely, and even more so when I collapsed on my mattress cackling like a fool.

—"Uncle, why does the line of Jeriba have only five names? You say that human lines have many names."

I nodded. "The five names of the Jeriba line are things to which their bearers must add deeds. The deeds are important—not the names."

"Gothig is Shigan's parent as Shigan is my parent."

"Of course. You know that from your recitations."

Zammis frowned. "Then, I *must* name my child Ty when I become a parent?"

"Yes. And Ty must name its child Haesni. Do you see something wrong with that?"

"I would like to name my child Davidge, after you."

I smiled and shook my head. "The Ty name has been served by great bankers, merchants, inventors, and—well, you know your recitation. The name Davidge hasn't been served by much. Think of what Ty would miss by not being Ty."

Zammis thought awhile, then nodded. "Uncle, do you think Gothig is alive?"

"As far as I know."

"What is Gothig like?"

I thought back to Jerry talking about its parent, Gothig. "It taught music, and is very strong. Jerry . . . Shigan said that its parent could bend metal bars with its fingers. Gothig is also very dignified. I imagine that right now Gothig is also very sad. Gothig must think that the line of Jeriba has ended."

Zammis frowned and its yellow brow furrowed. "Uncle, we must make it to Draco. We must tell Gothig the line continues."

"We will."

The winter's ice began thinning, and boots, tent, and packs were ready. We were putting the finishing touches on our new insulated suits. As Jerry had given the *Talman* to me to learn,

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the golden cube now hung around Zammis's neck. The Drac would drop the tiny golden book from the cube and study it for hours at a time.

"Uncle?"

"What?"

"Why do Dracs speak and write in one language and the humans in another?"

I laughed. "Zammis, the humans speak and write in many languages. English is just one of them."

"How do the humans speak among themselves?"

I shrugged. "They don't always; when they do, they use interpreters—people who can speak both languages."

"You and I speak both English and Drac; does that make us interpreters?"

"I suppose we could be, if you could ever find a human and a Drac who want to talk to each other. Remember, there's a war going on."

"How will the war stop if they do not talk?"

"I suppose they will talk, eventually."

Zammis smiled. "I think I would like to be an interpreter and help end the war." The Drac put its sewing aside and stretched out on its new mattress. Zammis had outgrown even its old mattress, which it now used for a pillow. "Uncle, do you think that we will find anybody beyond the scrub forest?"

"I hope so."

"If we do, will you go with me to Draco?"

"I promised your parent that I would."

"I mean, after. After I make my recitation, what will you do?"

I stared at the fire. "I don't know." I shrugged. "The war might keep us from getting to Draco for a long time."

"After that, what?"

"I suppose I'll go back into the service."

Zammis propped itself up on an elbow. "Go back to being a fighter pilot?"

"Sure. That's about all I know how to do."

"And kill Dracs?"

I put my own sewing down and studied the Drac. Things had changed since Jerry and I had slugged it out—more things than I had realized. I shook my head. "No. I probably won't be a pilot—not a service one. Maybe I can land a job flying commercial ships." I shrugged. "Maybe the service won't give me any choice."

Zammis sat up, was still for a moment, then it stood, walked

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over to my mattress and knelt before me on the sand. "Uncle, I don't want to leave you."

"Don't be silly. You'll have your own kind around you. Your grandparent, Gothig, Shigan's siblings, their children—you'll forget all about me."

"Will you forget about me?"

I looked into those yellow eyes, then reached out my hand and touched Zammis's cheek. "No. I won't forget about you. But, remember this, Zammis: you're a Drac and I'm a human, and that's how this part of the universe is divided."

Zammis took my hand from his cheek, spread the fingers and studied them. "Whatever happens, Uncle, I will never forget you."

The ice was gone, and the Drac and I stood in the wind-blown drizzle, packs on our backs, before the grave. Zammis was as tall as I was, which made it a little taller than Jerry. To my relief, the boots fit. Zammis hefted its pack up higher on its shoulders, then turned from the grave and looked out at the sea. I followed Zammis's glance and watched the rollers steam in and smash on the rocks. I looked at the Drac. "What are you thinking about?"

Zammis looked down, then turned toward me. "Uncle, I didn't think of it before, but . . . I will miss this place."

I laughed. "Nonsense! This place?" I slapped the Drac on the shoulder. "Why would you miss this place?"

Zammis looked back out to sea. "I have learned many things here. You have taught me many things here, Uncle. My life happened here."

"Only the beginning, Zammis. You have a life ahead of you." I nodded my head at the grave. "Say goodbye."

Zammis turned toward the grave, stood over it, then knelt to one side and began removing the rocks. After a few moments, it had exposed the hand of a skeleton with three fingers. Zammis nodded, then wept. "I am sorry, Uncle, but I had to do that. This has been nothing but a pile of rocks to me. Now it is more." Zammis replaced the rocks, then stood.

I cocked my head toward the scrub forest. "Go on ahead. I'll catch up in a minute."

"Yes, Uncle."

Zammis moved off toward the naked trees, and I looked down at the grave. "What do you think of Zammis, Jerry? It's bigger than you were. I guess snake agrees with the kid." I squatted next to the grave, picked up a small rock and added it to the pile. "I

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guess this is it. We're either going to make it to Draco, or die trying." I stood and looked at the sea. "Yeah, I guess I learned a few things here. I'll miss it, in a way." I turned back to the grave and hefted my pack up. "*Ehdevva sahn, Jeriba Shigan.* So long, Jerry."

I turned and followed Zammis into the forest.

The days that followed were full of wonder for Zammis. For me, the sky was still the same, dull grey, and the few variations in plant and animal life that we found were nothing remarkable. Once we got beyond the scrub forest, we climbed a gentle rise for a day, and then found ourselves on a wide, flat, endless plain. It was ankle deep in a purple weed that stained our boots the same color. The nights were still too cold for hiking, and we would hole up in the tent. Both the greased tent and suits worked well keeping out the almost constant rain.

We had been out perhaps two of Fyrine IV's long weeks when we saw it. It screamed overhead, then disappeared over the horizon before either of us could say a word. I had no doubt that the craft I had seen was in landing attitude.

"Uncle! Did it see us?"

I shook my head. "No. I doubt it. But it was landing. Do you hear? It was landing somewhere ahead."

"Uncle?"

"Let's get moving! What is it?"

"Was it a Drac ship, or a human ship?"

I cooled in my tracks. I had never stopped to think about it. I waved my hand. "Come on. It doesn't matter. Either way, you go to Draco. You're a noncombatant, so the USE forces couldn't do anything, and if they're Dracs, you're home free."

We began walking. "But, Uncle, if it's a Drac ship, what will happen to you?"

I shrugged. "Prisoner of war. The Dracs say they abide by the interplanetary war accords, so I should be all right." *Fat chance,* said the back of my head to the front of my head. The big question was whether I preferred being a Drac POW or a permanent resident of Fyrine IV. I had figured that out long ago. "Come on, let's pick up the pace. We don't know how long it will take to get there, or how long it will be on the ground."

Pick 'em up; put 'em down. Except for a few breaks, we didn't stop—even when night came. Our exertion kept us warm. The

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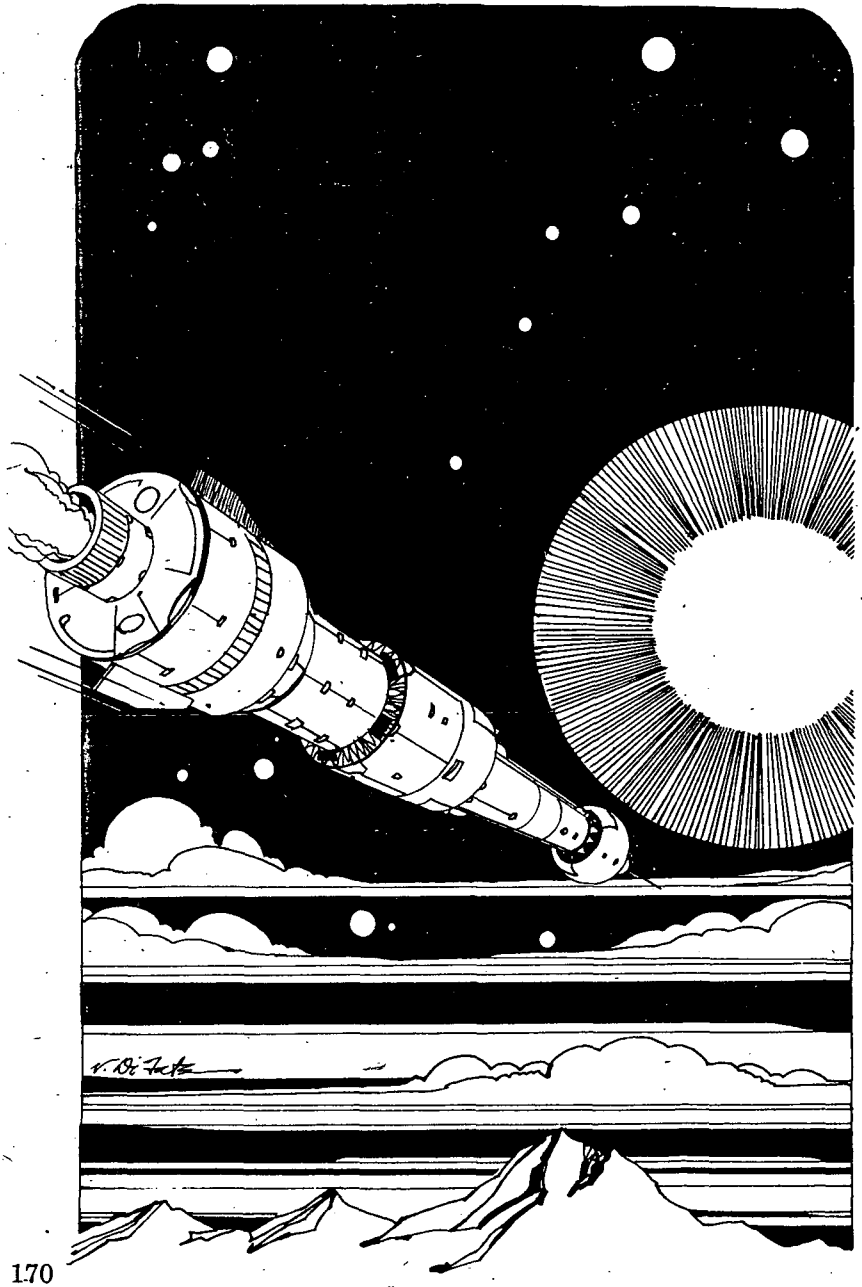

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horizon never seemed to grow nearer. The longer we slogged at it, the duller my mind grew. It must have been days, my mind as numb as my feet, when I fell through the purple weed into a hole. Immediately, everything grew dark, and I felt a pain in my right leg. I felt the blackout coming, and I welcomed its warmth, its rest, its peace.

"Uncle? Uncle? Wake up! Please, wake up!"

I felt slapping against my face, although it felt somehow detached. Agony thundered into my brain, bringing me wide awake. Damned if I didn't break my leg. I looked up and saw the weedy edges of the hole. My rear end was seated in a trickle of water. Zammis squatted next to me.

"What happened?"

Zammis motioned upwards. "This hole was only covered by a thin crust of dirt and plants. The water must have taken the ground away. Are you all right?"

"My leg. I think I broke it." I leaned my back against the muddy wall. "Zammis, you're going to have to go on by yourself."

"I can't leave you, Uncle!"

"Look, if you find anyone, you can send them back for me."

"What if the water in here comes up?" Zammis felt along my leg until I winced. "I must carry you out of here. What must I do for the leg?"

The kid had a point. Drowning wasn't in my schedule. "We need something stiff. Bind the leg so it doesn't move."

Zammis pulled off its pack, and kneeling in the water and mud, went through its pack, then through the tent roll. Using the tent poles, it wrapped my leg with snakeskins torn from the tent. Then, using more snakeskins, Zammis made two loops, slipped one over each of my legs, then propped me up and slipped the loops over its shoulders. It lifted, and I blacked out.

On the ground, covered with the remains of the tent, Zammis shaking my arm. "Uncle? Uncle?"

"Yes?" I whispered.

"Uncle, I'm ready to go." It pointed to my side. "Your food is here, and when it rains, just pull the tent over your face. I'll mark the trail I make so I can find my way back."

I nodded. "Take care of yourself."

Zammis shook its head. "Uncle, I can carry you. We shouldn't separate."

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I weakly shook my head. "Give me a break, kid. I couldn't make it. Find somebody and bring 'em back." I felt my stomach flip, and cold sweat drenched my snakeskins. "Go on; get going."

Zammis reached out, grabbed its pack and stood. The pack shouldered, Zammis turned and began running in the direction that the craft had been going I watched until I couldn't see it. I faced up and looked at the clouds. "You almost got me that time, you *kizlode* sonofabitch, but you didn't figure on the Drac . . . you keep forgetting . . . there's two of us. . . ." I drifted in and out of consciousness, felt rain on my face, then pulled up the tent and covered my head. In seconds, the blackout returned.

"Davidge? Lieutenant Davidge?"

I opened my eyes and saw something I hadn't seen for four Earth years: a human face. "Who are you?"

The face, young, long, and capped by short blond hair, smiled. "I'm Captain Steerman, the medical officer. How do you feel?"

I pondered the question and smiled. "Like I've been shot full of very high grade junk."

"You have. You were in pretty bad shape by the time the survey team brought you in."

"Survey team?"

"I guess you don't know. The United States of Earth and the Dracon Chamber have established a joint commission to supervise the colonization of new planets. The war is over."

"Over?"

"Yes."

Something heavy lifted from my chest. "Where's Zammis?"

"Who?"

"Jeriban Zammis; the Drac that I was with."

The doctor shrugged. "I don't know anything about it, but I suppose the Draggers are taking care of it."

Draggers. I'd once used the term myself. As I listened to it coming out of Steerman's mouth, it seemed foreign: alien, repulsive. "Zammis is a Drac, not a Dragger."

The doctor's brows furrowed, then he shrugged. "Of course. Whatever you say. Just you get some rest, and I'll check back on you in a few hours."

"May I see Zammis?"

The doctor smiled. "Dear, no. You're on your way back to the Delphi USEB. The . . . Drac is probably on its way to Draco." He nodded, then turned and left. God, I felt lost. I looked around and

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saw that I was in the ward of a ship's sick bay. The beds on either side of me were occupied. The man on my right shook his head and went back to reading a magazine. The one on my left looked angry.

"You damned Dragger suck!" He turned on his left side and presented me his back.

Among humans once again, yet more alone than I had ever been. *Misnuuram va siddeth*, as Mistan observed in the Talman from the calm perspective of eight hundred years in the past. Loneliness is a thought—not something done to someone; instead, it is something that someone does to oneself. *Jerry shook its head that one time, then pointed a yellow finger at me as the words it wanted to say came together. "Davidge . . . to me loneliness is a discomfort—a small thing to be avoided if possible, but not feared. I think you would almost prefer death to being alone with yourself."*

Misnuuram yaa va nos misnuuram van dunos. "You who are alone by yourselves will forever be alone with others." Mistan again. On its face, the statement appears to be a contradiction; but the test of reality proves it true. I was a stranger among my own kind because of a hate that I didn't share, and a love that, to them, seemed alien, impossible, perverse. *"Peace of thought with others occurs only in the mind at peace with itself."* Mistan again. Countless times, on the voyage to the Delphi Base, putting in my ward time, then during my processing out of the service, I would reach to my chest to grasp the *Talman* that no longer hung there. What had become of Zammis? The USESF didn't care, and the Drac authorities wouldn't say—none of my affair.

Ex-Force pilots were a drag on the employment market, and there were no commercial positions open—especially not to a pilot who hadn't flown in four years, who had a gimpy leg, and who was a Dragger suck. "Dragger suck" as an invective had the impact of several historical terms—Quisling, heretic, fag, nigger lover—all rolled into one.

I had forty-eight thousand credits in back pay, and so money wasn't a problem. The problem was what to do with myself. After kicking around the Delphi Base, I took transportation to Earth and, for several months, was employed by a small book house translating manuscripts into Drac. It seems that there was a craving among Dracs for Westerns: "Stick 'em up *naagusaat!*"

"*Nu Geph,* lawman." *Thang, thang!* The guns flashed and the

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kizlode shaddsaat bit the *thessa*.

I quit.

I finally called my parents. *Why didn't you call before, Willy? We've been worried sick . . . Had a few things I had to straighten out, Dad . . . No, not really . . . Well, we understand, son . . . it must have been awful . . . Dad, I'd like to come home for awhile. . . .*

Even before I put down the money on the used Dearman Electric, I knew I was making a mistake going home. I felt the need of a home, but the one I had left at the age of eighteen wasn't it. But I headed there because there was nowhere else to go.

I drove alone in the dark, using only the old roads, the quiet hum of the Dearman's motor the only sound. The December midnight was clear, and I could see the stars through the car's bubble canopy. Fyrine IV drifted into my thoughts, the raging ocean, the endless winds. I pulled off the road onto the shoulder and killed the lights. In a few minutes, my eyes adjusted to the dark and I stepped outside and shut the door. Kansas has a big sky, and the stars seemed close enough to touch. Snow crunched under my feet as I looked up, trying to pick Fyrine out of the thousands of visible stars.

Fyrine is in the constellation Pegasus, but my eyes were not practiced enough to pick the winged horse out from the surrounding stars. I shrugged, felt a chill, and decided to get back in the car. As I put my hand on the doorlatch, I saw a constellation that I did recognize, north, hanging just above the horizon: Draco. The Dragon, its tail twisted around Ursa Minor, hung upside down in the sky. Eltanin, the Dragon's nose, is the homestar of the Dracs. Its second planet, Draco, was Zammis's home.

Headlights from an approaching car blinded me, and I turned toward the car as it pulled to a stop. The window on the driver's side opened and someone spoke from the darkness.

"You need some help?"

I shook my head. "No, thank you." I held up a hand. "I was just looking at the stars."

"Quite a night, isn't it?"

"Sure is."

"Sure you don't need any help?"

I shook my head. "Thanks . . . wait. Where is the nearest commercial spaceport?"

"About an hour ahead in Salina."

"Thanks." I saw a hand wave from the window, then the other

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car pulled away. I took another look at Eltanin, then got back in my car.

Six months later, I stood in front of an ancient cut-stone gate wondering what in the hell I was doing. The trip to Draco, with nothing but Dracs as companions on the last leg, showed me the truth in Namvaac's words: "Peace is often only war without fighting." The accords, on paper, gave me the right to travel to the planet, but the Drac bureaucrats and their paperwork wizards had perfected the big stall long before the first human step into space. It took threats, bribes, and long days of filling out forms, being checked and rechecked for disease, contraband, reason for visit, filling out more forms, refilling out the forms I had already filled out, more bribes, waiting, waiting, waiting . . .

On the ship, I spent most of my time in my cabin, but since the Drac stewards refused to serve me, I went to the ship's lounge for my meals. I sat alone, listening to the comments about me from other booths. I had figured the path of least resistance was to pretend I didn't understand what they were saying. It is always assumed that humans do not speak Drac.

"Must we eat in the same compartment with the *Irkmaan* slime?"

"Look at it, how its pale skin blotches—and that evil smelling thatch on top. Feh! The smell!"

I ground my teeth a little and kept my glance riveted to my plate.

"It defies the *Talman* that the universe's laws could be so corrupt as to produce a creature such as that."

I turned and faced the three Dracs sitting in the booth across the aisle from mine. In Drac, I replied: "If your line's elders had seen fit to teach the village *kiz* to use contraceptives, you wouldn't even exist." I returned to my food while the two Dracs struggled to hold the third Drac down.

On Draco, it was no problem finding the Jeriba estate. The problem was getting in. A high stone wall enclosed the property, and from the gate, I could see the huge stone mansion that Jerry had described to me. I told the guard at the gate that I wanted to see Jeriba Zammis. The guard stared at me, then went into an alcove behind the gate. In a few moments, another Drac emerged from the mansion and walked quickly across the wide lawn to the gate. The Drac nodded at the guard, then stopped and faced me. It

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was a dead ringer for Jerry.

"You are the *Irkmaan* that asked to see Jeriba Zammis?"

I nodded. "Zammis must have told you about me. I'm Willis Davidge."

The Drac studied me. "I am Estone Nev, Jeriba Shigan's sibling. My parent, Jeriba Gothig, wishes to see you." The Drac turned abruptly and walked back to the mansion. I followed, feeling heady at the thought of seeing Zammis again. I paid little attention to my surroundings until I was ushered into a large room with a vaulted stone ceiling. Jerry had told me that the house was four thousand years old. I believed it. As I entered, another Drac stood and walked over to me. It was old, but I knew who it was.

"You are Gothig, Shigan's parent."

The yellow eyes studied me. "Who are you, *Irkmaan*?" It held out a wrinkled, three-fingered hand. "What do you know of Jeriba Zammis, and why do you speak the Drac tongue with the style and accent of my child Shigan? What are you here for?"

"I speak Drac in this manner because that is the way Jeriba Shigan taught me to speak it."

The old Drac cocked its head to one side and narrowed its yellow eyes. "You knew my child? How?"

"Didn't the survey commission tell you?"

"It was reported to me that my child, Shigan, was killed in the battle of Fyrine IV. That was over six of our years ago. What is your game, *Irkmaan*?"

I turned from Gothig to Nev. The younger Drac was examining me with the same look of suspicion. I turned back to Gothig. "Shigan wasn't killed in the battle. We were stranded together on the surface of Fyrine IV and lived there for a year. Shigan died giving birth to Jeriba Zammis. A year later the joint survey commission found us and—"

"Enough! Enough of this, *Irkmaan!* Are you here for money, to use my influence for trade concessions—what?"

I frowned. "Where is Zammis?"

Tears of anger came to the old Drac's eyes. "There is no Zammis, *Irkmaan!* The Jeriba line ended with the death of Shigan!"

My eyes grew wide as I shook my head. "That's not true. I know. I took care of Zammis—you heard nothing from the commission?"

"Get to the point of your scheme, *Irkmaan*. I haven't all day."

I studied Gothig. The old Drac had heard nothing from the

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commission. The Drac authorities took Zammis, and the child had evaporated. Gothig had been told nothing. Why? "I was with Shigan, Gothig. That is how I learned your language. When Shigan died giving birth to Zammis, I—"

"*Irkmaan,* if you cannot get to your scheme, I will have to ask Nev to throw you out. Shigan died in the battle of Fyrine IV. The Drac Fleet notified us only days later."

I nodded. "Then, Gothig, tell me how I came to know the line of Jeriba? Do you wish me to recite it for you?"

Gothig snorted. "You say you know the Jeriba line?"

"Yes."

Gothig flipped a hand at me. "Then, recite."

I took a breath, then began. By the time I had reached the hundred and seventy-third generation, Gothig had knelt on the stone floor next to Nev. The Dracs remained that way for the three hours of the recital. When I concluded, Gothig bowed its head and wept. "Yes, *Irkmaan*, yes. You must have known Shigan. Yes." The old Drac looked up into my face, its eyes wide with hope. "And, you say Shigan continued the line—that Zammis was born?"

I nodded. "I don't know why the commission didn't notify you."

Gothig got to its feet and frowned. "We will find out, *Irkmaan*—what is your name?"

"Davidge. Willis Davidge."

"We will find out, Davidge."

Gothig arranged quarters for me in its house, which was fortunate, since I had little more than eleven hundred credits left. After making a host of inquiries, Gothig sent Nev and me to the Chamber Center in Sendievu, Draco's capital city. The Jeriba line, I found, was influential, and the big stall was held down to a minimum. Eventually, we were directed to the Joint Survey Commission representative, a Drac named Jozzdn Vrule. It looked up from the letter Gothig had given me and frowned. "Where did you get this, *Irkmaan*?"

"I believe the signature is on it."

The Drac looked at the paper, then back at me. "The Jeriba line is one of the most respected on Draco. You say that Jeriba Gothig gave you this?"

"I felt certain I said that; I could feel my lips moving—"

Nev stepped in. "You have the dates and the information concerning the Fyrine IV survey mission. We want to know what

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happened to Jeriba Zammis."

Jozzdn Vrule frowned and looked back at the paper. "Estone Nev, you are the founder of your line, is this not true?"

"It is true."

"Would you found your line in shame? Why do I see you with this *Irkmaan*?"

Nev curled its upper lip and folded its arms. "Jozzdn Vrule, if you contemplate walking this planet in the foreseeable future as a free being, it would be to your profit to stop working your mouth and to start finding Jeriba Zammis."

Jozzdn Vrule looked down and studied its fingers, then returned its glance to Nev. "Very well, Estone Nev. You threaten me if I fail to hand you the truth. I think you will find the truth the greater threat." The Drac scribbled on a piece of paper, then handed it to Nev. "You will find Jeriba Zammis at this address, and you will curse the day that I gave you this."

We entered the imbecile colony feeling sick. All around us, Dracs stared with vacant eyes, or screamed, or foamed at the mouth, or behaved as lower-order creatures. After we had arrived, Gothig joined us. The Drac director of the colony frowned at me and shook its head at Gothig. "Turn back now, while it is still possible, Jeriba Gothig. Beyond this room lies nothing but pain and sorrow."

Gothig grabbed the director by the front of its wraps. "Hear me, insect: If Jeriba Zammis is within these walls, bring my grandchild forth! Else, I shall bring the might of the Jeriba line down upon your pointed head!"

The director lifted its head, twitched its lips, then nodded. "Very well. Very well, you pompous *Kazzmidth!* We tried to protect the Jeriba reputation. We tried! But now you shall see." The director nodded and pursed its lips. "Yes, you overwealthy fashion follower, now you shall see." The director scribbled on a piece of paper, then handed it to Nev. "By giving you that, I will lose my position, but take it! Yes, take it! See this being you call Jeriba Zammis. See it, and weep!"

Among trees and grass, Jeriba Zammis sat upon a stone bench, staring at the ground. Its eyes never blinked, its hands never moved. Gothig frowned at me, but I could spare nothing for Shigan's parent. I walked to Zammis. "Zammis, do you know me?"

The Drac retrieved its thoughts from a million warrens and raised its yellow eyes to me. I saw no sign of recognition. "Who

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are you?"

I squatted down, placed my hands on its arms and shook them. "Dammit, Zammis, don't you know me? I'm your Uncle. Remember that? Uncle Davidge?"

The Drac weaved on the bench, then shook its head. It lifted an arm and waved to an orderly. "I want to go to my room. Please, let me go to my room."

I stood and grabbed Zammis by the front of its hospital gown. "Zammis, it's me!"

The yellow eyes, dull and lifeless, stared back at me. The orderly placed a yellow hand upon my shoulder. "Let it go, *Irkmaan*."

"Zammis!" I turned to Nev and Gothig. "Say something!"

The Drac orderly pulled a sap from its pocket, then slapped it suggestively against the palm of its hand. "Let it go, *Irkmaan*."

Gothig stepped forward. "Explain this!"

The orderly looked at Gothig, Nev, me, and then Zammis. "This one—this creature—came to us professing a love, a *love* mind you, of humans! This is no small perversion, Jeriba Gothig. The government would protect you from this scandal. Would you wish the line of Jeriba dragged into this?"

I looked at Zammis. "What have you done to Zammis, you *kizlode* sonofabitch? A little shock? A little drug? Rot out its mind?"

The orderly sneered at me, then shook its head. "You, *Irkmaan*, do not understand. This one would not be happy as an *Irkmaan vul*—a human lover. We are making it possible for this one to function in Drac society. You think this is wrong?"

I looked at Zammis and shook my head. I remembered too well my treatment at the hands of my fellow humans. "No. I don't think it's wrong . . . I just don't know."

The orderly turned to Gothig. "Please understand, Jeriba Gothig. We could not subject the Jeriba Line to this disgrace. Your grandchild is almost well and will soon enter a reeducation program. In no more than two years, you will have a grandchild worthy of carrying on the Jeriba line. Is this wrong?"

Gothig only shook its head. I squatted down in front of Zammis and looked up into its yellow eyes. I reached up and took its right hand in both of mine. "Zammis?"

Zammis looked down, moved its left hand over and picked up my left hand and spread the fingers. One at a time Zammis pointed at the fingers of my hand, then it looked into my eyes, then examined the hand again. "Yes . . ." Zammis pointed again.

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"One, two, three, *four, five*!" Zammis looked into my eyes. "Four, five!"

I nodded. "Yes. Yes."

Zammis pulled my hand to its cheek and held it close. "Uncle . . . Uncle. I told you I'd never forget you."

I never counted the years that passed. My beard was back, and I knelt in my snakeskins next to the grave of my friend, Jeriba Shigan. Next to the grave was the four-year-old grave of Gothig. I replaced some rocks, then added a few more. Wrapping my snakeskins tightly against the wind, I sat down next to the grave and looked out to sea. Still the rollers steamed in under the grey-black cover of clouds. Soon, the ice would come. I nodded, looked at my scarred, wrinkled hands, then back at the grave.

"I couldn't stay in the settlement with them, Jerry. Don't get me wrong; it's nice. Damned nice. But I kept looking out my window, seeing the ocean, thinking of the cave. I'm alone, in a way. But it's good. I know what and who I am, Jerry, and that's all there is to it, right?"

I heard a noise. I crouched over, placed my hands upon my withered knees, and pushed myself to my feet. The Drac was coming from the settlement compound, a child in its arms.

I rubbed my beard. "Eh, Ty, so that is your first child?"

The Drac nodded. "I would be pleased, Uncle, if you would teach it what it must be taught: the line, the *Talman;* and about life on Fyrine IV, our planet called 'Friendship'."

I took the bundle into my arms. Chubby three-fingered arms waved at the air, then grasped my snakeskins. "Yes, Ty, this one is a Jeriba." I looked up at Ty. "And how is your parent, Zammis?"

Ty shrugged. "It is as well as can be expected. My parent wishes you well."

I nodded. "And the same to it, Ty. Zammis ought to get out of that air-conditioned capsule and come back to live in the cave. It'll do it good."

Ty grinned and nodded its head. "I will tell my parent, Uncle."

I stabbed my thumb into my chest. "Look at me! You don't see me sick, do you?"

"No, Uncle."

"You tell Zammis to kick that doctor out of there and to come back to the cave, hear?"

"Yes, Uncle." Ty smiled. "Is there anything you need?"

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I nodded and scratched the back of my neck. "Toilet paper. Just a couple of packs. Maybe a couple of bottles of whiskey—no, forget the whiskey. I'll wait until Haesni, here, puts in its first year. Just the toilet paper."

Ty bowed. "Yes, Uncle, and may the many mornings find you well."

I waved my hand impatiently. "They will, they will. Just don't forget the toilet paper."

Ty bowed again. "I won't, Uncle."

Ty turned and walked through the scrub forest back to the colony. Gothig had put up the cash and moved the entire line, and all the related lines, to Fyrine IV. I lived with them for a year, but I moved out and went back to the cave. I gathered the wood, smoked the snake, and withstood the winter. Zammis gave me the young Ty to rear in the cave, and now Ty had handed me Haesni. I nodded at the child. "Your child will be called Gothig, and then . . . " I looked at the sky and felt the tears drying on my face. " . . . and then, Gothig's child will be called Shigan." I nodded and headed for the cleft that would bring us down to the level of the cave.

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Dear Sir:

First, I must say that I find your magazine truly enjoyable. Of course, your letter column seems to indicate that nearly everyone enjoys it. Do you ever get letters from people who DON'T like it?

Secondly, the number of stories appearing in your magazine which are first sales is highly encouraging, I'm sure, to many would-be writers. I've enclosed a self-addressed, stamped envelope, so please send me a copy of your requirement sheet and format information. Thank you.

Sincerely,

Dave Dellinger
Springfield OR

Oh, sure, a few don't like it, and a few even have the temerity not to like stories of mine. The percentage of unfavorables we print is about equal to the percentage of unfavorables we get.

—Isaac Asimov

Dear Sir:

I'd like to compliment you on the fine mix of stories in your magazine. Your February issue, only the second copy of *IA'sfm* I've seen in my community, was wonderful. "A Bait of Dreams" and "Back to Byzantium" were two of the most beautiful science fiction fantasies I've ever read. By adding them to the other good stories in that issue, you've made me a fan.

I'd like to add that the guy from whom I borrowed the magazine enjoys his subscription immensely—I only hope he'll continue to lend me his copies! Both of us are looking forward to reading Dr. Asimov's new novels when they are published and we have money.

Sincerely,

Kimberley Wheat
Corning NY

You're not a fan till you buy the magazine—B-U-Y. Till then you're just a free-loader.

—Isaac Asimov

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Gentle Editors:

I have just purchased the February edition of *IA'sSFM* (what do you think of that abbr., Dean?) and would like to tell you that I am delighted with it. Though this is only the second SF magazine I have read, I have been raiding the SF section at the library since I was in sixth grade, so I am not a new hand at this stuff.

I am overjoyed by the prospect of *I, Robot* becoming a movie. If done properly, it should help move SF movies one step closer to being equal to the books and magazines, instead of lagging far behind as they have been. If this movie makes it to the big screen, I will have heart-felt gladness for Isaac. If it doesn't, I'll have 10,000 nasty letters sent to the so-called producers.

Speaking of the Master of Science Fiction, it has always bothered me when people use Dr. Asimov, Mr. Asimov, etc. Because of the informal and personal way in which he writes his introductions, I feel as if he is an old friend I have known for years. If you are reading this, Isaac, and don't like me using your first name, please inform me and I will stop instantly.

And before I forget, will you send me one "How to Mail a Manuscript to *IA'sfm*" kit as soon as possible. [*Yes, GHS*]

Good luck,

Todd Tomason
304 E 9th St.
Spencer IA 51301

PS: Judging by the quality of your magazine, you're not really going to need the good luck wish, but I couldn't think of anything else to use as a closing.

PPS: Dr. Asimov *is* awfully formal, isn't it?

I am perfectly content to have everyone call me Isaac. Believe it or not, I like the name.

—Isaac Asimov

Dear Dr. Asimov:

I have just finished "Nothing for Nothing" (*IA'sfm,* Feb. 1979), and while I liked the story, I must caution you to play by the rules. Rule #1: think up new plots. In "The Big Front Yard," Clifford D. Simak impressed aliens with a practical human idea: paint, and we traded it for advanced technology, the saddle (electromagnetic, to

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be sure, but a saddle nonetheless). In your story, we get the bow and arrow in return for representational art. In "Rescue Mission," Arthur C. Clarke sends starfaring races the clear message that if they aren't afraid of humans yet they had better be, and soon. Clarke's "Encounter in the Dawn" tells of an alien survey team that bestows a knife and a flashlight on a pre-Babylonian Earther.

There might be an editorial on imagination and invention in this. Do you suppose that we struggling young science fiction writers would see print if we strung old hats together like that? A plot about a robot detective has been buzzing my brain lately. He catches claustrophobia in some steel caves and then sets up a foundation to preserve civilization when the galactic empire collapses. Get it?—just like monasteries preserved classical learning after the fall of Rome.

Please advise an innocent fellow like myself if such a plot might amount to anything.

Originally yours,

John A. Schaible
Holly MI

Remember Rule #1A: There Are No New Plots, Only New Variations.

—Isaac Asimov

Dear Dr. Asimov,

I would like to explain to you how I read an SF magazine. What I do is leaf through the magazine, checking each piece for its merits as I go. I give each story one paragraph. If I am not captivated by the writing at the end of that first paragraph I quit and continue leafing. I have gone through entire magazines in this fashion, reaching the back cover in total frustration.

Why, you ask. Because I have a tremendous amount of book fiction which I could be enjoying instead of wading through poor magazine fiction.

One paragraph may seem like an awfully poor effort on my part, but I feel it is all I, as a reader, owe the writer. That first paragraph should contain a lot. It should set the stage by describing clearly and concisely the general setting (I don't like being left in the dark!); it should contain some sort of action, using lots of good, beefy verbs; and it should develop the character(s) at least a little, perhaps by exposing an idiosyncrasy. All of the above should be crammed in there as straightforward and as compact as possible. A writer should

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take great pains with such an important part of his work: the beginning.

The reason I'm telling you this is because your magazine has done quite well. (I can almost hear the "Of course it has!") One or two stories out of every issue come close enough to the above criteria that I will continue reading them. *This statement should be taken as a high compliment!* I have yet to read a magazine in which every story started with a "grabber." *Isaac Asimov's Science Fiction Magazine* comes the closest to that imaginary, one-hundred-percent good prozine. You may yet keep me from catching up on my non-magazine fiction.

Finally, I would like to humbly ask for a copy of your requirement sheet and format information as one of these days I may have finished a manuscript of my own that will—hopefully—pass my own requirements.

Fannishly yours,

John W. Reed
2013 So. 17th St.
Rogers AR 72756

You forget that reactions are subjective. What may grab you instantly may not grab others, so we dare not use you as an absolute standard.

—Isaac Asimov

What any successful writer must do, however, is to get a large proportion of the John Reeds of our audience interested early in each story. That's not easy; but very little about good writing is easy—and making it look easy is about the hardest part of writing.

—George H. Scithers

Dear Dr. Asimov and Mr. Scithers,

You seem sincere about wanting readers' comments, so here goes. The stories I feel most cheated by are those which add a science fiction gimmick to a story which belongs in another magazine. (I'm talking about plots, not about the writing.) Examples: "African Blues," Feb. 78, where the blue wo/man was from space, but the story was still about an earthlike birth (which I would rather not be reminded of); and "Up-Top Summer," Feb. '78, in which country folk meet a modern con man whom they get rid of by launching him into space.

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I feel betrayed by stories like "The Bitter End," Sept.-Oct. '78, when I find I am reading about a regular old wizard, and "A Bait of Dreams," Feb. '79, which tantalizes the reader (by the Ranga eye) but doesn't follow through on its potential. (Sure, it served to get the heroine into trouble, but she becomes a victim of overkill—bondage, branding, rape, whipping—shades of Rosemary Rogers, sans dashing hero.)

Long fiction which gets too fat around the middle is frustrating. Most of us don't have a lot of time to read, and we want to get the most from it. (Incidentally, did you intentionally go monthly during skiing season? I'm feeling snowed.) (Sorry.)

Science fact has its place, but "On Kepler, Newton, & Co.," Feb. '79, was a bit much. I felt like it was "assigned reading," so I quit. Letters are usually interesting, but don't your feet get wet from all that kissing?

Now for the good part. About the only story I ever read twice (by choice) was John Ford's "There Will be a Sign," Jan.-Feb. '78. The writing was tight (not one slack clause!), the suspense was maintained, and the human emotion came through with impact. Please, bring some more from Mr. Ford. "A Time for Terror," March '79, was another story that gives the reader something of value and dares him to brush it off like dandruff from a coat.

I hope your writers take these comments as they were meant—in a positive vein.

Yours for a better *IA'sfm.*

Patricia Kaspar
20822 Meadow Oak Rd.
Saratoga CA 95070

Feet-kissing? We presume our readers are sincere as—we presume—you are.

—Isaac Asimov

Dear Dr. Asimov and/or Mr. Scithers,

Okay, okay, so I like puns too. But if you're going to print this many, you might as well call it *Isaac Asimov's Pun Magazine*! So let's tone down the puns and bring up the science fiction again, huh?

I'll bet that 99% of your readers haven't noticed something crucial about your magazine: YOU DON'T USE COLUMNS. Unlike most magazines, who divide that pages up into two columns, you keep

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your lines going all the way across the page. Columns give me headaches. They are confusing and hard to read.

Along with most of your readers, I'd say you have an excellent magazine. I especially enjoyed James Gunn's articles, "On the Road to Science Fiction." Aside from a few points, "Nothing for Nothing" seems to be the kind of story that has been done so many times that I shudder at the thought of reading just one more. Come on, Dr. Asimov, you can do better than that!

About the question of the age of your readers—I'm thirteen.

And thanks for not printing those stories about the end of the world, in capital letters. After just a few issues of *Analog, F & SF,* and *Galaxy* I felt ready to commit suicide.

One more thing: Perhaps some of your readers don't know it, but *The Fountains of Paradise* is Arthur C. Clarke's last book. I think he deserves a tribute. We're all going to miss him terribly.

Yours truly,

Scott Hewitt
Mountainside NJ

***Arthur* Who?**

—Isaac Asimov

Mr. Asimov,

May I please be one of the thousands that have received your requisite for manuscript format? [*Of course! GHS*] With that out of the way I'd like to comment on a collection of related short stories I just finished reading. After passing it by many times (sorry) I finally decided to pick up *I, Robot* and read it. You see, I go to the University of Illinois at Circle Campus where I belong to the Science Fiction Society which has a fairly extensive science fiction library. Well, the book I picked up happens to be one of the original paperbacks printed (circa 1956) complete with a picture of the author on the back cover. Who, I asked myself, is that dashing young man with the dark hair, suitcoat, and tie? Of course I knew who it was (short sideburns and all) but was still shocked, I just could not think of that man in the photo as "The Good Doctor." I love the magazine, new talent deserves a chance and it warms my heart to see it. Keep up the good work!

Sincerely yours,

Roberta A. Beal

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The hair may have grayed, and the clothing grown more informal, but I'm just as dashing as ever. Would I lie to you?

—Isaac Asimov

Dear Mr. Scithers,

In my usual manner, I have idly sat by and watched the world go by, forming comments and criticisms, but saying nothing to anyone. But Ginny Martin's derogatory remarks concerning the short story "Bat Durston, Space Marshal" was a bit much. I am forced to speak.

"Bat Durston, Space Marshal" is one of the few stories my memory has retained in its "easy access and recall" area. I loved the story and surprisingly, so did my brain. (We don't often agree.) This only happens when there is a profound and necessary piece of knowledge to be retained, or a positive feeling to be reinforced. In the case of this story, it was the latter.

I can agree with Ginny that "BD,SM" was not good. I *can* agree, but I won't. Sure it was a "bad" story. Sure it had everything in it that the paragraph in page two said not to have. Sure it was clichéd. BUT DID NOBODY READ THE *ENDING*??? You did. And I think that's why you published it.

It is because of stories like this one that I read science fiction and very little of any other kind of fiction. I like to be taught while being entertained, and most asimovian science fiction does this. This is why I subscribe to *IA'sfm*. This story, and others such as "But, Do They Ride Dolphins?" (Excellent!), "A Hideous Splotch of Purple" (Fantastically written!), "Polly Plus," and the Momus tales are among the many that have a bit of knowledge that can be used, or can produce a feeling that needs to be felt. These stories show us, either directly, or indirectly, how to make ourselves better. And anything that does that cannot be all bad.

Don't stop publishing stories like "Bat Durston, Space Marshal," Mr. Scithers. I need them. *We* need them.

Sincerely,

B. R. Barbre
Harvard MA

The best stories are those people fight over. There's a certain dullness in having stories universally accepted (except when they're mine).

—Isaac Asimov

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Dear Mr. Scithers,

I find both of your magazines heartening, like a breath of fresh air. While occasionally lacking in technical polish, most of the stories are both original and inspirational, qualities most welcome in this day of apparent doom, gloom, breast-beating, and creative bankruptcy. Thank you for shedding a little light.

Specific stories that have really impressed me so far are the Momus series, "Ker-Plop," and "Back to Byzantium." They all make me want to sit right down and start typing—if only on an entry in the horrid pun contest (and I don't even make puns as a rule). You're a life-saver. Thanks again.

Sincerely,

Theresa Holmes
Flat Rock MI

Lacking in technical polish? Never! Technical russian, maybe.
—Isaac Asimov

Dear Sir;

I am steadfastly resisting an urge to yell from my window, "At last! I've discovered a science fiction magazine with a sense of humanity as well as hardware, *and* a sense of humor." Since true fans of science fiction are relatively rare here in Hannibal, Missouri, I doubt such a revelation would be well received.

I thoroughly enjoyed the entire magazine. But, I especially liked "Outside" by Keith Davis. It was so well done that the ending took me by surprise and sent me into hysterics at the final image. Another favorite of mine was "A Bait Of Dreams" by Jo Clayton. This one appealed to me on its strength of characterization and skillful blending of the culture that had molded the character.

Thanks for an excellent magazine! I only wish I had discovered it earlier.

Sincerely,

Sharon K. Wisdom
Hannibal MO

Since I am a Mark Twain idolator, I am certain that Hannibalians must be SF fans. Look again. Surely you have made a mistake.
—Isaac Asimov

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Dear George and others,

Being still behind in my subscription and just finished reading the February issue of *IA'sfm* I figured, "What the heck, go ahead and write a letter." It is always my policy to try and tell someone when they are doing a great job. You guys really deserve it. Starting with the 1978 Sept./Oct. issue I have thoroughly enjoyed each one. I'm not one to give critical reviews to each story but suffice it to say the overall content has been outstanding. Being almost as gray as the good Doctor A., I've been a science fiction reader for more years that I really want to think about.

You asked for some pertinent information on why we bought the first issue, etc. I must confess, I haven't seen an issue on the local magazine stands. I subscribe to the S.F. Book Club and, as I recall, received a subscription form with one of their mailings. The other possibility may have been an ad in *Galaxy* to which I was subscribing at that time. (Yes, I've quit, mostly because I don't like stories which carry on from one issue to another.) Anyway, it was the Asimov name that hooked me. I'm glad it did.

Sincerely,

Linda A. Kropff
San Jose CA

How can a child prodigy like myself have become a standard for grayness in a mere half-century? What a tragedy!

—Isaac Asimov

Dear Dr. A & Mr. Scithers:

Okay, okay—I can't resist the temptation any longer; enclosed is the required self-addressed, stamped envelope. Please send me your manuscript requirement sheet and format information. [*Done! GHS*]

After reading science fiction for about 25 years, I finally found a science fiction magazine that I could read from cover to cover—your March 1979 issue. In all my previous attempts to enjoy pulp science fiction, I was frustrated by unsatisfactory stories and inevitably abandoned each magazine before examining every story. I was particularly alienated (an excellent term to use in a discussion of sci-fi) by the stylistic, non-science trend of the late '60s. Your approach is a welcome change.

Your March 1979 issue was an excellent mix of long and short material. I'd like to see more of the short forms. Pohl's "Mars Masked" was absorbing, but the ending was telegraphed earlier in the story,

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and it was a let-down, a non-resolution of events. (That's one of the late-60s trends I disliked, and if this hadn't been the last story in the magazine, I might have abandoned it there.)

The biographical notes on each writer are interesting, but I'd also like to see some old-fashioned blurbs that give an idea of the nature of each story.

In any case, your magazine is excellent yet still improving. I look forward to the next issue. Please keep up the good work.

Best regards,

Bob Perkins
Los Angeles CA

The difficulty with blurbs is that they can mislead—or they can give away the story. I've suffered from both varieties.

—Isaac Asimov

Dear Dr. Asimov & Mr. Scithers:

I want you to know that the March 1979 issue of *IA'sfm* is the first SF magazine I've ever read cover to cover. I enjoyed every last bit of it.

However my favorite story was "Someone Else's House," by Lee Chisholm. This was my first acquaintance with her work and I hope it won't be the last.

You guys certainly seem to have talent for publishing readable stories. In fact they are so readable I'm uneasy. From my experience of recent years the fact that your magazine is so entertaining contradicts its reality. Will the Good Doctor please pinch someone of his choice to be sure? Whatever you decide, real or not, please keep it coming.

Would you please send me information on your story needs and manuscript format. [*Yes! GHS*]

Sincerely,

Larry R. Card
444 N. Eaton Ave.
Indianapolis IN 46219

Don't be uneasy. With a team like George, Shawna, and Joel, how can we miss?

—Isaac Asimov

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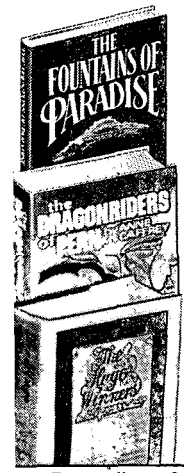

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